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CAR VENTILATION.

At the recent convention of railway electrical engineers in Chicago, a paper on the ventilation of railroad cars was presented by Mr. B. A. Stowe, and is abstracted upon another page of this issue. In this paper attention is called to the very common lack of proper ventilating facilities, and the advisability of applying the electric fan for the purpose of driving the vitiated air from the car.

Every one who has done much traveling in well filled cars must appreciate the justice of the claim that the cars are often illy ventilated. This is true not only on the steam railroads, but probably to a greater extent on the surface and elevated electric cars in our towns and cities, for it is in them that the greatest crowding is encountered. Electric current is always available on the electric railways, while on steam roads it is usually available only on Pullman cars or through passenger coaches in which the crowding is least liable to occur. Sleeping cars are, however, very seldom properly ventilated and heated, and they constitute a very appropriate point of application for the first endeavors in this line.

In the winter season, when windows are kept closed, the problem of ventilation is intimately connected with the problem of heating, and the cost of heating will be necessariiy increased by proper supply of fresh air. Steam railroads are usually generous in this matter and the supply of heat is just as likely to be too great as too meager. On the electric street cars, however, there is sometimes seen an effort to economize too closely in this direction, and on certain lines it is evident that the conductors have instructions to lose as little warm air from the cars as possible. The result, under crowded conditions, is highly objectionable.

In computing the supply of fresh air necessary to properly observe the requirements of hygiene, it would seem that Mr. Stowe has been entirely too liberal, since he allows 3,000 cubic feet of air per hour for each passenger. This quantity is evidently based upon the "dilution" idea of ventilation, according to which enough fresh air is admitted to dilute the exhaled carbonic acid gas to the point where it will not exceed by more than 0.03 per cent the normal quantity in the air. But where the exhaled air is expelled from the car so that it mixes but slightly with the incoming air, a smaller supply is amply sufficient for good ventilation, and

under proper conditions 500 cubic feet per hour per person is a satisfactory amount.

An average rate of respiration is twenty per minute, and an average quantity of air inhaled may be taken as 500 cubic centimeters, or 30 cubic inches. The quantity of air respired per hour may then be taken as 36,000 cubic inches or about 20 cubic feet. The quantity of carbonic acid gas is increased by respiration from 0.04 to about 4.4 per cent. To dilute this to 0.07 per cent requires about 150 times the volume of air exhaled, or 3,000 cubic feet per hour.

The danger from bad air is not only due to its larger percentage of chemical impurities, chiefly carbon dioxide, but to the more virulent character of the disease germs it contains and the decreased resisting power that we have in a vitiated atmosphere.

In some tests conducted on street cars in Chicago it has been shown conclusively that the attempt to ventilate the car by dilution of the respired air with even a considerable influx of fresh air is far from being as satisfactory and reliable as the provision of a definite circulation by exhausting the foul air at the top of the car and supplying fresh air from inlets near the heaters at the floor. Attempts to make this circulation automatic by such an arrangement of deck ventilators that will create an outward flow of the air at the top of the car are not very successful because there are no suction currents developed when the car stops and when the wind has the same direction and velocity as the car. It has been shown by Mr. Stowe and others that the use of motor-driven exhaust fans provides a positive ventilating system at all times and one that is remarkably economical in operating cost, considering the great value of the results attained.

Our railroad companies seem to spare no expense in adding to the luxury of travel on first-class coaches. Electric lighting is becoming quite universal in such service as the public shows a marked preference for it. Electric fans for agitating the air are conspicuously mounted in many cars. The provision of electric exhaust fans, which are the only positive means for insuring proper ventilation, is therefore a very reasonable thing to expect. The ability to provide such fans should be a further incentive to the steam railroads to equip electrically all their passenger cars, so that the already popular electric light may be supplied for all their patrons along with the destined-to-be popular electric ventilation.

On electric railroads and street cars the provision of electric exhaust fans is a very simple matter and one that can therefore be justly demanded. Electric cars are being built larger and more tightly than heretofore, so that natural ventilation through leaky doors and windows has been much diminished and the need for pure air greatly increased. Since the means for supplying this air can be provided at small cost and trouble, it is imperative that it be done.

USES OF WIRELESS TELEGRAPHY.

A short time ago we commented on the value of wireless telegraphy as a police help in communicating with vessels at sea. Recent successful experiments in England also point to its early use on trains, thus enabling the police to narrow down the search for an escaping criminal or permitting a business man or public official to remain in touch with his associates during a long trip.

Another valuable feature of the wireless telegraph is its immunity from interference by an enemy. A striking example of this occurs in Portugal. According to advices from Europe received as we go to press, the republican element in that turbulent state is engaged in a revolution to overthrow the monarchy. All telegraph and telephone wires, it is stated, have been cut, and the only messages that have come through from the center of activity have been transmitted by wireless. This suggests that the legations in foreign countries be fitted with wireless apparatus so that our ambassadors and ministers abroad may be able to communicate with the outside world in times of trouble. The Boxer outrages in China a few years ago show the necessity for such a precaution.

As to the use of wireless at sea, one possibility seems to have been overlooked. In case of a wreck or a disaster in mid-ocean, when the crew and passengers of a disabled or foundered vessel have taken to the boats, how can they inform comparatively near-by vessels of their plight? The answer is, by wireless. Each lifeboat should carry a small wireless outfit, similar to the portable apparatus used in the Army. Such an outfit would have a radius of about fifty miles and the use of it may well result in the saving of many lives at sea.

ELECTRICAL APPLIANCES ON THE DOCK.

A field for the use of electric current which has been little cultivated in this country is to be found in the use of motors for hoisting and kindred purposes at docks and piers.

In his address to the Association of Edison Illuminating Companies, to be found on other pages of this issue, President Murray called attention to the possibilities of business in this direction. Very little has been done in this country in equipping our large ports with electrically operated cranes, and other hoisting and conveying apparatus. That such applications of electric power can be made to great advantage is evidenced by the experience of several European cities, which have extensive developments of this kind.

Since every hour during which she lies in port represents, in a certain sense, a loss in earning power of a vessel, any improvement in apparatus which would facilitate the handling of freight should constitute a distinct economy, even though it would necessitate a considerable investment of capital. In economy of operation and ease of control the electric motor is superior to steam or compressed-air engines

for this type of work, and loading and unloading should be greatly facilitated by its use.

A start has already been made upon the water line of New York City, and other ports which have supply mains ready to be tapped should fall in line. The soliciting of new business of this kind is usually up-hill work, but when a customer is once secured the returns amply repay the effort, for the demand will usually be large and although the load-factor may be low in itself, that of the station will usually be improved.

STUMBLING BLOCKS IN RATE CASES.

Central-station organizations which are called upon to defend their lighting or power rates frequently find that popular misconceptions of the electrical industry are in large degrees responsible for hostile criticisms of the existing charges for energy. In a business so technical as the supply of electricity to meet the diversified demands of a modern city and its suburban tributary areas, it is out of the question to count upon a widespread realization of the conditions under which the company operates unless by a vigorous policy of publicity the company is constantly driving home to its patrons the radical differences between its service and the ordinary mercantile conduct of affairs. No better missionary work can be done than to give the public reasons for changes in policy or modifications in rates, or to press home the reasons why the bills of different customers in the same line of business vary. There are other mistaken notions to combat, such as the idea that public-utility rates ought to be so low that a return of only five or six per cent will be realized; the contention that a single company in a community has to face no competition in any form, and that a rate in one town should compare closely with that in another.

The public is in general disposed to grant a public-service corporation a reasonable return upon its investment provided the conditions are understood. It is time to bring to popular attention the fact that profits will be tolerated in ordinary mercantile business which would not for a moment be favorably received by the customers of an electric light or power company. At public hearings where this question is brought out the petitioners for reductions in rates invariably reply by calling attention to the supposed monopoly of the central station in its local field, with the final argument that such enterprises are specially protected by the state. There exists a widespread notion that the state in some way guarantees the financial integrity of such enterprises, and the tendency is for the public wholly to lose sight of the fact that the most acute competition exists between the central station and the progress of the art, between the concentrated course of electrical supply and the independent plant. There is always the chance that the consumer of electric current may get the idea that he can install and operate a plant of his own more cheaply than he can buy current. The central station is constantly threatened with the entrance of cheaper power into the community by rival organizations with ample capital, and it deserves to be so threatened unless by its own skill in management and willingness to send apparatus of established efficiency to the scrap heap it demonstrates its ability to keep abreast of the times. It pays to point out the evolution of apparatus in the plant and the costliness of throwing out old apparatus and installing new machinery; to keep on hand photographs showing its development; and to maintain lists of intelligible expenditures which have brought money and trade to the local labor and material market. As for the paternal oversight of the state, in the matter of corporate success, it amounts to little more than protection from confiscation, for anything less than a fair return upon the investment is nothing else, if one may judge by the difficulties of obtaining new capital under hostile popular criticism. In the long run there is a considerable element of risk in public service which should command the right to a liberal profit, which in turn will enable improvements to be maintained to the benefit of the whole community.

Charges of discrimination are the most troublesome of all. Customers naturally compare notes as to their respective charges, and discrepancies must be explained. In a recent case the petitioner contended that it was not right that his bill for power, when employing a 6.5-horsepower motor should be $436 per year, when his neighbor, in a similar line of business, with a motor of about 12-horsepower rating, paid only $235 per annum. The chairman of the commission hearing this case made short work of this complaint, pointing out that the amount of use and not the rating of the installation was the main factor. The policy of even the smaller companies in dealing with these questions of rates is important, and the growing custom of printing explanations of the rates with examples of their application on small folders for popular distribution is most excellent.

In the older days there was without question a good deal of discrimination practised, since terms were made with each customer according to the needs of the moment. Today all that is passing; progressive managers do their best to treat everybody with the same conditions alike; and shun special discounts. There is room for much more complete explanations to the public of discrepancies between bills, particularly where the bills are made up on the basis of the two factors, readiness-to-serve, and consumption. On its own part, the central-station industry is in need of more accurate and more complete records of the power demands of its consumers individually. Given such data the explanation of apparent discriminations before state tribunals will be much more easily effected.

Large Gas Power Plant at Joliet.

The erection of an electric generating plant utilizing the waste gases of the Joliet steel works has been begun at Joliet, Ill., by the Illinois Steel Company. It is estimated that this power plant will cost nearly $1,000,000 before it is fully completed to its contemplated capacity.

The plant equipment will be housed in a building 110 by 208 feet, located north of the present engine rooms for blast furnaces No. 3 and No. 4. The building will be of brick and steel construction on a concrete foundation. The initial installation will consist of four gas-engine-driven generators each capable of developing 3,000 kilowatts. The gas-washing and purifying equipment will adjoin the main structure. Gas will be piped from the 400 coke ovens near the steel works and also from the blast furnaces. Much of this gas is now wasted.

All the electrical energy generated will be used for power and lighting purposes about the works. A considerable number of steam engines in sizes up to 500 horsepower will be displaced by electric drive. The Company now purchases a certain amount of electrical energy from the nearby hydroelectric plant of the Sanitary District of Chicago.

Papers at the Illuminating Engineering Society Convention.

The fourth annual convention of the Illuminating Engineering Society will be held October 24 and 25, 1910, in Baltimore, Md.

The following is a list of papers to be read, and the authors: V. R. Lansingh, "The Value of Illuminating Engineering to the Manufacturer." John F. Gilchrist, "Practical Value of Illuminating Engineering to the Central Station." W. J. Serrill, "The Value of Illuminating Engineering to the Commercial Man." J. S. Codman, "Illuminating-Engineering Sheets for the Calculation and Recording of Data." C. F. Oehlmann, "Central-Station-Illuminating-Engineering-Department Work and Methods Applied by the Denver Gas and Electric Company." Norman Macbeth, "The Relations Between Pressure and Light Output with Various Gas Lamps and Burners." J. G. Felton and E. J. Bray, "The Temperature Rise Due to the Energy Radiated in the Lower Hemisphere from Different Light Sources." Herbert E. Ives, "Some Spectral Luminosity Curves Obtained by Flicker and Equality-of-Brightness Photometers." Preston S. Millar, "An Unrecognized Aspect of Street Illumination." S. O. Mast, "The Effect of Light on the Movement of Lower Organisms."

The committee on arrangements consists of H. K. Dodson, W. J. A. Bliss and Douglass Burnett.

New York Electrical Show.

The fourth annual Electrical Exposition will be held at Madison Square Garden, New York, for ten days between October 10 and 20 under the direction of George F. Parker.

Arrangements for exhibits have been made by a large number of the leading electrical firms, and about 50,000 square feet of floor space will be available to exhibitors of electrical goods.

The general decorative scheme will be green and gold and the exhibitors' booths will be after entirely new models. The features of the great show, however, will be the interior lighting, for there will be on exhibition the most brilliant electric display ever seen in New York. New lamps are to be put in for this occasion and 100,000 electric lights will flood the main hall with the brightness of daylight. The tower also is to be illuminated in a manner never before undertaken, all four sides being banked with arc lights. In addition to all this there will be exhibited some wonderful novelties in electric signs, which will add to the interest of the lighting features.

One of the interesting features of the exposition will be a demonstration of long-distance wireless telephony.

Water Filtration.

At an interesting meeting of the Pittsburg Electric Boosters' Club, held September 30, at the Hotel Duquesne, Morris Knowles, formerly superintendent, Department of Filtration, addressed the Club on this work, and on other water problems involving the city.

The speaker was entirely responsible for the success of the filtration plant in use at this time, and is an authority of national reputation on filtration matters. Mr. Knowles is also a member of the Pittsburg Civic Commission, and outlined this work, and pointed out wherein the Pittsburg Electric Boosters' Club as a whole and its members individually could be of help in promoting the welfare of the City.

About one hundred members were present.

Chicago Electrical Show.

The sixth annual Electrical Show will be held at the Coliseum, Chicago, January 7 to 21, 1911. The management has inaugurated the policy of sharing the profits derived from the Show with the exhibitors. The basis of this is that after paying the expense of conducting the Show and the administration and a small reserve fund to the Exposition Company, the remaining profits, if any, are to be divided equally between the Exposition Company and the exhibitors, prorated among them in accordance with the amount of floor space paid for by each exhibitor.

The increasing success and popularity of the preceding shows and the liberal inducements offered to exhibitors in the forthcoming show will undoubtedly make for a more elaborate and better exposition than any previous one.

The Show will be held, as before, under the management of the Electrical Trades Exposition Company, and Homer E. Niesz will be manager, with offices at 150 Michigan Boulevard.

Tungsten Lamps for Viaduct Lighting.

The new viaduct on Grand Avenue in Milwaukee will be lighted by sixty-three clusters of tungsten lamps. Each cluster will consist of five sixty-watt lamps mounted on an ornamental standard harmonizing with the architectural design of the viaduct. The committee that considered the matter also looked into the possibility of using several forms of arc lamps, but came to the conclusion that the tungsten clusters would conform best to the ornamental character of the structure.

Sheffield Electrometallurgical Society.

The Sheffield Electrometallurgical Society has been formed at Sheffield, England, to include those engaged in electroplating, electrogilding, and electric refining of metals. Monthly meetings will be held at the University of Sheffield. Professor Arnold has been elected president, Professor McWilliam, T. Scott Anderson and Dr. Hutton vice-presidents, G. Bernard Brook and Frank Mason honorary secretaries.

Charles F. Brush.

The development of the arc light and the arc lighting system in this country probably owes more to Charles F. Brush than to any other man.

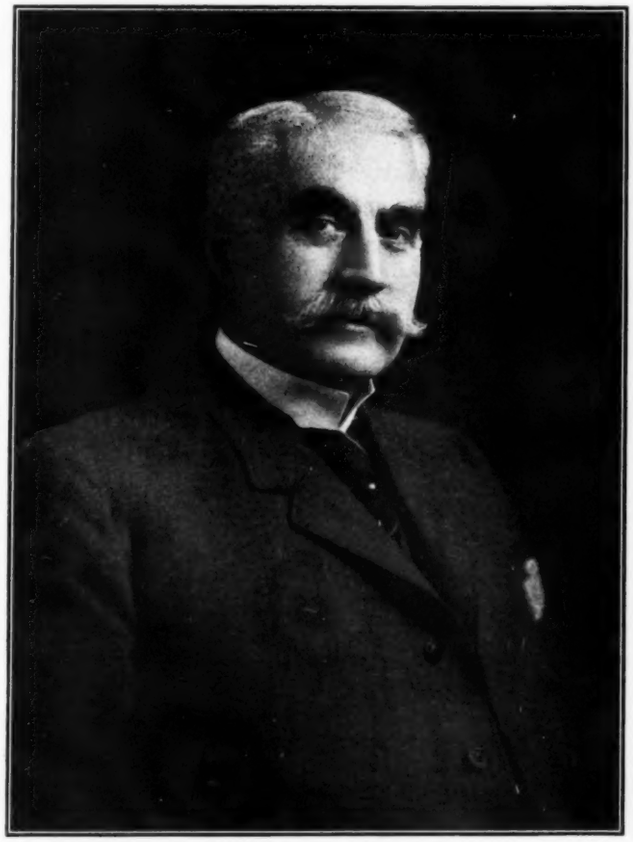
Charles Francis Brush was born in Cuyahoga County, O., March 17, 1849. His father, Col. Isaac E. Brush, was a manufacturer in New York who went to Ohio in 1846. His mother was Della Wisner Phillips. Both parents descended from old lines of American families. The boy obtained his early education in the public schools and was graduated from the high school in Cleveland.

While still at school he became interested in electrical apparatus, and constructed static machines, induction coils, and small motors, and at graduation wrote an essay on the dynamo and arc light based upon Wilde's experiments in London. He then went to the University of Michigan, and was graduated as a mining engineer in 1869. A post-graduate course brought him the degrees of M. S. at this University, and Ph. D. at Western Reserve University. The latter conferred upon him the degree of LL. D., and Kenyon College conferred a similar honor in 1903.

Dr. Brush soon turned his attention exclusively to electrical matters and as early as 1876 had designed a dynamo which was constructed under his own direction. This pioneer machine was exhibited at the Paris Exposition in the United States Historical Exhibit. In 1877 he introduced the compound field winding for constant potentials. This idea, now so generally applied in electric lighting, was first used in plating machines.

Turning his attention to the arc lamp, Dr. Brush developed both a practical apparatus for regulating a lamp and a high-potential dynamo for series lighting. The first plant of this kind was installed in Boston in 1878. After that the work developed rapidly and has ever since been a growing industry. Among other things, Dr. Brush introduced the copper plating of carbon electrodes, which simple invention brought him large royalties.

In 1881, the Brush Electric Company was incorporated and capitalized at $3,000,000, a very large figure for those days. About ten years later the General Electric Company was formed and absorbed the old company, and the works were removed from Cleveland to Schenectady. In the meantime other corporations had been formed in various parts of the world to introduce the Brush apparatus and system.



CHARLES F. BRUSH,
Pioneer Inventor in Electric Arc Lighting.

The storage battery has also received considerable attention from Dr. Brush, and as a result of his efforts considerable improvement in the manufacture of lead plates was effected.

In 1881 Dr. Brush was decorated by the French Government as a chevalier of the Legion of Honor, and in 1889 the American Academy of Arts and Sciences awarded him its Rumford medal.

Dr. Brush is a member of the American Institute of Electrical Engineers; the National Electric Light Association; the Franklin Institute; the American Philosophical Society; the American Chemical Society; the Archeological Institute of America; the American Historical Association, and a fellow of the American Association for the Advancement of Science. He is a life member of the British Association; of the American Society of Mechanical Engineers; of the Cleveland Chamber of Commerce, and of the Ohio State Board of Commerce. The Union, University, Country, Mayfield, Euclid and Golf Clubs of Cleveland, and the University Club of New York all number him among their membership. He is president of the Winous Point Shooting Club; of the Cleveland Arcade Company, and of the Linde Air Products Company. He is a trustee of the Western Reserve University; Adelbert College; University School, the Cleveland School of Art and the Case School of Applied Science. He is a vestryman of Trinity Cathedral, and a member of the Sinking Fund Commission of Cleveland. He has served as president of the Chamber of Commerce and of the Union Club.

Dr. Brush was married in 1875 to Mary E. Morris, and has three children—Edna, Helene and Charles Francis, Jr.

Wireless Experiments from a Balloon.

An ascent in a dirigible balloon was recently made at Brentwood, England, by Lieutenant M. M. Maitland and A. de Mowbray Bellairs, for the purpose of testing a newly invented portable wireless apparatus. An altitude of 7,000 feet was reached, and the experiments are said to have demonstrated an advantage over the ordinary stationary equipment because of the greatly increased height.

Electric Hoists for Nevada Mines.

A Goldfield, Nev., report states that a 250-horsepower electric hoist will be installed at the Clermont shaft of the Goldfield Consolidated Mining Company, and that the Mohawk and Laguna shafts will each have a 150-horsepower electric hoist in the near future.

Great Extension of Electric Street Lighting in Chicago Assured.

The proposed street-lighting contract between the City of Chicago and the Sanitary District of Chicago has been ratified by the City Council and the Board of Trustees of these respective municipal corporations. In consequence of this the City will secure an increase of 10,000 arc lamps, which added to the 12,200 now in use will permit of the electric lighting of about three-fourths of the street mileage in the city. The city's area is nearly 200 square miles. It has been estimated that about 30,000 lamps would be required to light all of the streets, but, as many of these in the outskirts of the city have not yet been built up to any extent, no attempt will be made for a few years to make the electric street lighting universal.

By the terms of the new contract, which has been referred to in these columns on several occasions, the current for the entire 22,200 lamps will be supplied from the hydroelectric power system of the Sanitary District over 12,000-volt transmission lines running from the terminal station at Western Avenue and Thirty-first Street to the various street-lighting substations. The City now has thirteen of these substations already supplied in this manner. These will be turned over to the District, which will operate and maintain them.

The District will also install the necessary transmission lines, additional substations, distributing lines, lamp-posts and entire lighting equipment for 10,000 additional arc lamps on the streets and public places as directed by the City. At least 3,000 of these lamps are to be in operation within three years, but probably all will be placed before that time. Bonds will be issued by the District for $1,500,000 to $2,000,000 to make these extensions and also improvements in the present system. The City is unable to raise the necessary funds now because it has reached its bonding limit, but will repay the District within seven years by annual installments.

The new lamps are specified to be 10,000 450-watt arc lamps or other numbers and types of lamps having an equivalent power consumption, 4,500 kilowatts. The latter provision permits the use of tungsten, magnetite or flaming-arc lamps, although it was contemplated when negotiations began to use only 450-watt series inclosed alternating-current arcs on account of the simplicity of the substation equipment. Some 5,000 direct-current open-arc lamps now in use are to be replaced with either the contemplated type or a still more modern form of lamp.

The City will retain entire control and operation of its distributing lighting circuits including the trimming and maintenance of all the lamps. For the operation of the substations the Sanitary District will receive $1 per lamp per year. For the supply of the current the City will pay $15 per horsepower per year, or $1.25 per month. The maximum five-minute peak load on the primary side of the various substations will determine the horsepower rate of consumptions per month.

The combined energy and substation operation charge thus works out to about $10 per lamp per year. Even when there is added to this the cost of trimming and maintenance of the lamps and distributing lines and also interest and depreciation on the entire lighting equipment the annual cost per lamp will be considerably below the present cost. Some estimates have placed the annual cost under the new arrangement at $33 per lamp. Whether this includes all the fixed charges is not known. It has been stated by the chairman of the City Council's Finance Committee that including fixed charges on the rehabilitated and enlarged electric lighting plant of the City the annual cost of the 22,200 arc lamps will be only seventeen per cent in excess of the cost of the present 12,200 lamps.

The Sanitary District also gets, as a result of this contract, the use of any unused portions of underground and overhead lines of the City for the commercial sale of its surplus electrical power not used for municipal purposes. The City will also have the use of similar unused lines of the Sanitary District for its services.

More Tungsten Lighting at Indianapolis.

An installation of ornamental tungsten clusters was recently completed on Woodruff Place in Indianapolis. Five-lamp clusters almost identical with those used in the city's downtown streets are placed sixty feet apart in the esplanades of each of the three drives. The illumination is attracting much favorable attention. The lighting is much brighter and more uniform than that formerly afforded by the old arc lamps, which were mounted so high that much of their light was lost in the foliage of the trees.

Electric Lighting for Racing and Athletic Contests.

As an illustration of how electricity may promote evening outdoor sports, the Blair County fair at Dell Delight Park, near Altoona, Pa., was brilliantly illuminated by a multitude of arc lamps last week. All around the race track arc lamps were placed at 200-foot intervals. On several evenings races were held for both horse and man and other athletic contests took place by electric light to the great enjoyment of the crowds of spectators. The fair buildings were also brightly lighted by electric lamps.

Chicago Electric Club.

The members of the Chicago Electric Club were entertained at the regular weekly meeting on Wednesday, October 5, by a very interesting address on "The How and Why of Contracts," delivered by Gale Blocki of Chicago.

Mr. Blocki spoke of the various phases of contracts that appeal to the business man. He stated that the formality of contracts is fast disappearing and the documents of today should be as simple and of as few words as possible. Mr. Blocki also spoke of the origin of several customary but unimportant characteristics of contracts, deeds, etc.

A point which was emphasized by the speaker was that all contracts should have a time limit—some time at which the contract is completed—and it is his opinion that not enough attention is paid to this by most business men.

The fact that a contract drawn up on Sunday is legal was pointed out and several amusing experiences in this connection were related.

Following the address of Mr. Blocki, C. Walter Jones, of the Holophone Company, Newark, O., made a few remarks.

Announcement was made that F. J. Neuman of the Woods Motor Vehicle Company, Chicago, would address the club on the subject of "Electric Vehicles" at the meeting on October 12.

Electrical Notes from the Brussels Exhibition.

BY HENRI MARCHAND.

An account of some of the electrical exhibits in the English section of the Brussels Exhibition appeared in the issue of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for August 20 last. This article deals with the exhibits in the German and French sections.

A complete description of the numerous exhibits of these countries would furnish material for a bulky volume, hence a brief mention of a few of the principal features is all that can be made within the limits of a short article.

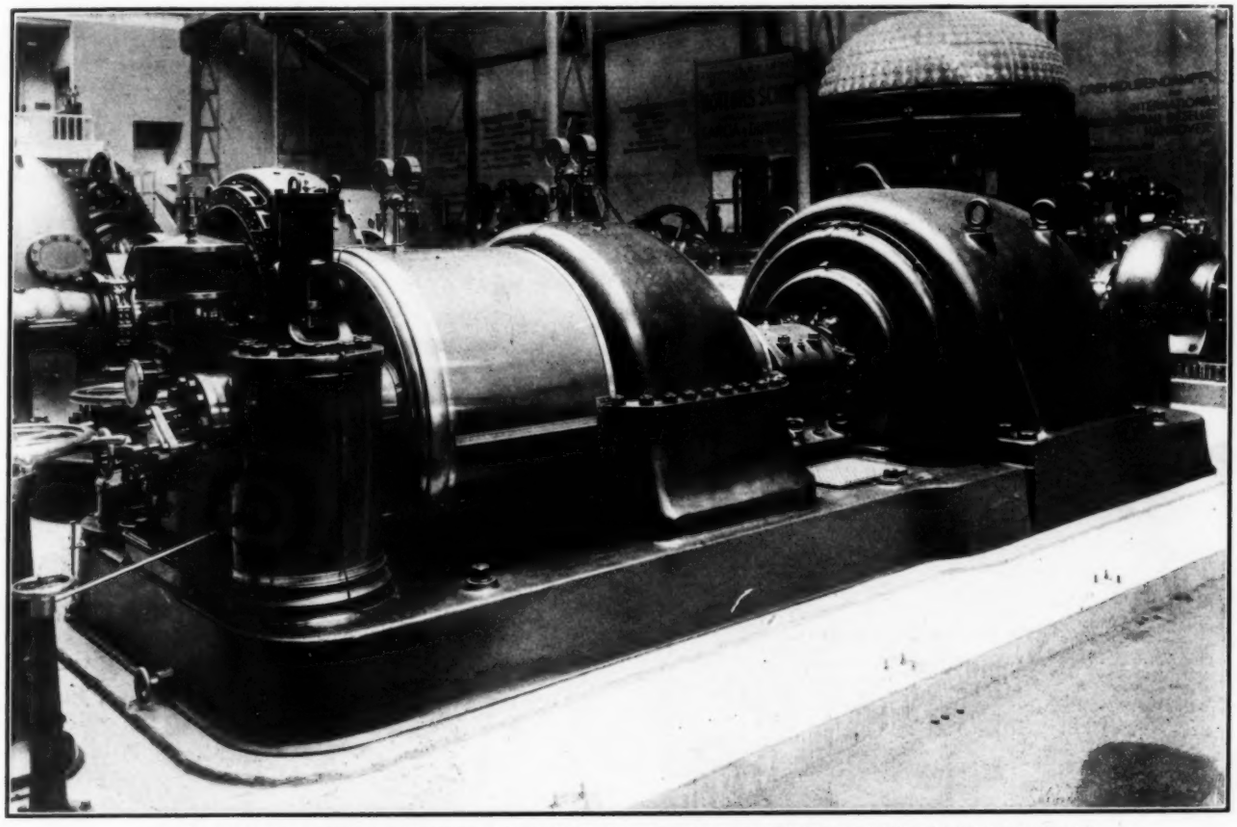


FIG. 1.—10,000-HORSEPOWER TURBO-ALTERNATOR, BY THE BERGMANN ELEKTRICITAETS-WERKE.

Prominent among the German exhibits is that of the Bergmann Elektricitæts-Werke, which includes a 10,000-horsepower turbo-alternator, shown in Fig. 1. The turbine is intended for working with superheated steam at 210 pounds pressure and runs at 1,500 revolutions per minute. The alternator is three-phase and rated at 6,800 kilowatts.

Another interesting item is an electric railway car with the following equipment: a gasoline motor, a direct-current direct-connected dynamo, two axle motors and the regulating devices.

One of the single-phase alternating-current motors shown is of a mixed type. It starts as a repulsion motor, but the characteristics soon approach those of the pure series motor, the fixed part possesses two groups of windings, the one being the induction winding proper and the other an auxiliary winding; the armature is built like an armature of an ordinary direct-current traction motor; regulation is obtained by acting on the voltage applied to the brushes; resistance coils are inserted on the connections between the induced winding and the commutator; ventilator blades are fixed on the axle so as to insure perfect cooling of the interior, while the frame is fitted with ribs.

The exhibit of the Deutsche Elektricitæts-Werke includes several most interesting pieces of apparatus. One three-phase motor, entirely inclosed, is intended for spinning-mill driving; this motor is designed so as to possess high power-factor and efficiency; the latter amounts to 87.7 per cent for the 0.75-horsepower size. One "Neptune" motor, the insulation of which is completely formed of mica, permits exposure to water and rain without injury; in fact, the motor is shown in Fig. 3, under a constant stream of water. An automatic machine for making commutators is shown in Fig. 5.

Dr. Paul Meyer is exhibiting some interesting devices, among which is a double cell-switch, containing twenty-three contacts fitted with a patented blow-out device. This consists of a switch mechanically connected to the brushes, set in motion by the common spindle and upon which is closed a circuit shunting successively the main contacts during the short-circuiting of the commutating cell. The auxiliary switch is the only part of the apparatus where sparks are likely to appear, and it is provided with easily interchangeable contacts. Such switches are used

for currents up to 3,000 amperes. The contacts consist of flexible laminated copper brushes. The switch may be moved automatically by means of a contact device differing from the usual voltmeter contact in the fact that the controlling circuit is closed on magnetic levers held in unsteble equilibrium; this device is formed of two magnets exerting opposite actions on their common armature system; this controlling device acts upon a relay, which cuts the motor in or out of circuit and may be operated by means of a push button. An indicating device shows at each moment the position of the movable contacts of the switch and the direction of its movement; this device is situated on the switchboard, at a distance from the switch. The push button is depressed as long as the brushes are not in the correct position, each step being obtained by a depression of the button, while a lever permits the switch to be moved several steps at a time.

Knife switches in oil baths are used in connection with the switchboard; instead of being alined perpendicularly to the board, contacts are parallel to the latter, a construction which facilitates the connections and the setting up of the releases. Said oil switches are electrically controlled by means of electromagnets, the circuits of which are controlled from a switch desk. The switch is shown in Fig. 4.

The Weston Instrument Company exhibits a line of its latest instruments and accessories, which are too well known to need a description; the exhibit includes three compensators for practical and laboratory uses, Weston normal cells, and a Bose liquid resistance.

The Regina Bogenlampen Fabrik exhibits inclosed arc lamps and Iota metallic filament lamps. The filament for the latter is manufactured by an entirely new process due to Hopfelt, insuring great mechanical resistance and electrical efficiency. Lamps with an efficiency of one candle per watt have a life of one thousand hours.

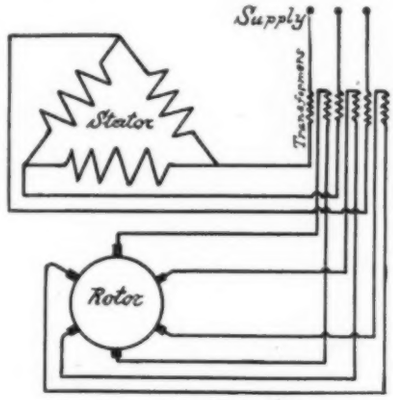


FIG. 2.—LATOUR MOTOR.

In the French Section there is exhibited a new induction furnace, built by Messrs. Poulenc. This furnace was patented by Dolter and permits a temperature of 1,000 to 1,100 degrees centigrade to be attained in two minutes, the current being thirty amperes at a pressure of 110 volts. The muffle is made of nickel and measures 190 by 70 by 60 millimeters.

The Ateliers de Construction du Nord et de l'Ost exhibits, along with various other electrical apparatus, an interesting line of motors. It includes direct-current and single-phase traction motors, covered by the Latour patents, single-phase collector constant-speed motors and variable-speed, three-phase collector motors. The principle of the Latour single-phase motor is too well known to need a description. The variable-speed three-phase collector motor is based upon the same principle; it is formed of an ordinary stator and a rotor similar to the armature of an ordinary direct-current dynamo, but fitted with three pairs of brushes, set at 120 degrees from each other. Three-phase currents are sent in the stator and rotor windings and, as the phase difference of the flux thus generated by both systems depends upon the position of the brushes, the rotative torque may be regulated by adjusting the brushes. Rotor and stator windings are in series with each other, although the rotor may be connected inductively to the main circuit, this is, by means of a transformer, as shown in Fig. 2. This kind of motor is now built for capacities between 0.5 and 300 horsepower. The limits of speed regulation are as one to three.

The telegraphic and telephonic apparatus exhibited illustrate in an interesting way the more common French methods. One of the first transmitters

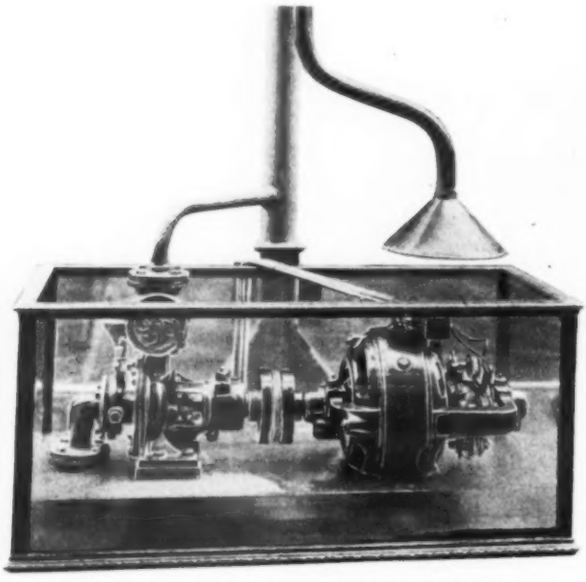


FIG. 3.—WATERPROOF SUBMERGIBLE MOTOR.

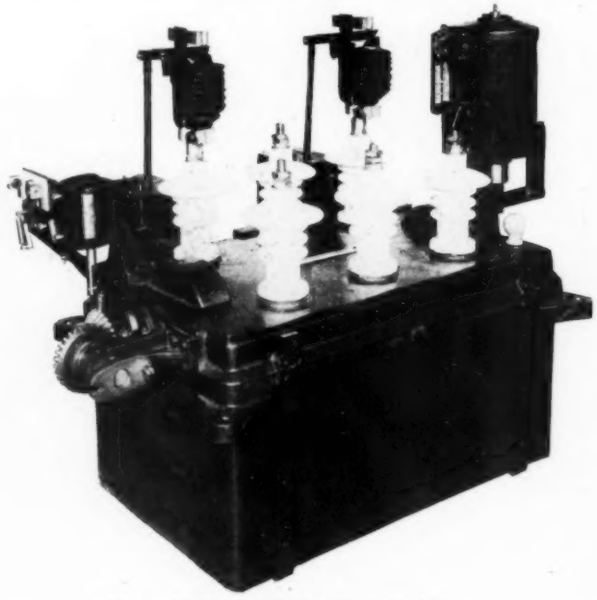


FIG. 4.—HIGH-TENSION OIL SWITCH.

used in France was the Ader microphone, still employed in consequence of its clearness in transmission. The Berthon transmitter which then came was the first transmitter fitted with molded granulated carbon; this type is still in use for urban service; in interurban and long-distance service, the types more ordinarily used at present are the Bailleux and the Paris-Rome transmitters. The Bailleux transmitter is formed of a fixed silvered metal disk, provided with grooves filled with broken anthracite. The Paris-Rome, which is one of the most recent transmitters, is able to carry heavy currents; the principle of the high-power transmitters is to have a double diaphragm microphone, on both faces of which the sound vibrations impinge. Such a transmitter is used in the "monophone," a device which combines the receiver and the transmitter in a minimum volume.

Inspection of Sanitary District Hydroelectric Plant.

A party of about forty persons were taken on the power yacht Robert R. from Chicago through the Drainage Canal to the powerhouse of the Sanitary District at Lockport on September 29. The party was conducted by N. F. Obright, contract agent, and John R. Harmon of the same office helped to explain the interesting features of the work.

Stops were made at the distributing station at Western Avenue, where the voltage is stepped down from 44,000 to 12,000, and at the controlling works.

The party was made up of customers of the Sanitary District, prospective customers and newspaper men, and served to emphasize the ability of the Sanitary District to supply electric power for all needs. Lunch was served on the boat and the return was made by train.

More Wages for Railroad Men.

A satisfactory adjustment of the wages and working rules of the five thousand conductors and motormen employed by the Boston & Northern and Old Colony Street Railway systems has been agreed upon. The new scale, which will be in force four years, gives every carman an increase of one and one-half cents an hour for a nine-hour work day. Men working in the shops will receive a five-per-cent increase. The two companies operate lines throughout eastern Massachusetts.

New Cars for Long Island Railroad.

The Long Island Railroad Company recently received sixty-five of the first-class all-steel motor cars out of the one hundred and forty ordered last year, and twenty-five more are promised by the manufacturers to arrive this month.

These cars which are being used for the main line between Jamaica and the Pennsylvania Railroad station in Manhattan, cost $18,500 each, and are said to be the latest and best constructed cars in the world. They are entirely fireproof and practically indestructible in case of a collision.

Flowers on Philadelphia Lampposts.

Now that practically all the downtown district of Philadelphia has been brilliantly lighted by the new arc lamps on ornamental standards, the merchants of Market Street, where the original installation of the new lamps was made less than a year ago, are seeking to make their street distinctive by the addition of flower baskets placed about midway of the lamp-posts. Several of the merchants have volunteered to provide such baskets on the standards in front of their premises and to keep them replenished with seasonable flowers throughout the year. It is likely that similar flower baskets will be placed on the lamp-posts about the City Hall. It is believed that this will not only add to the beauty of the standards but make their great height less noticeable.

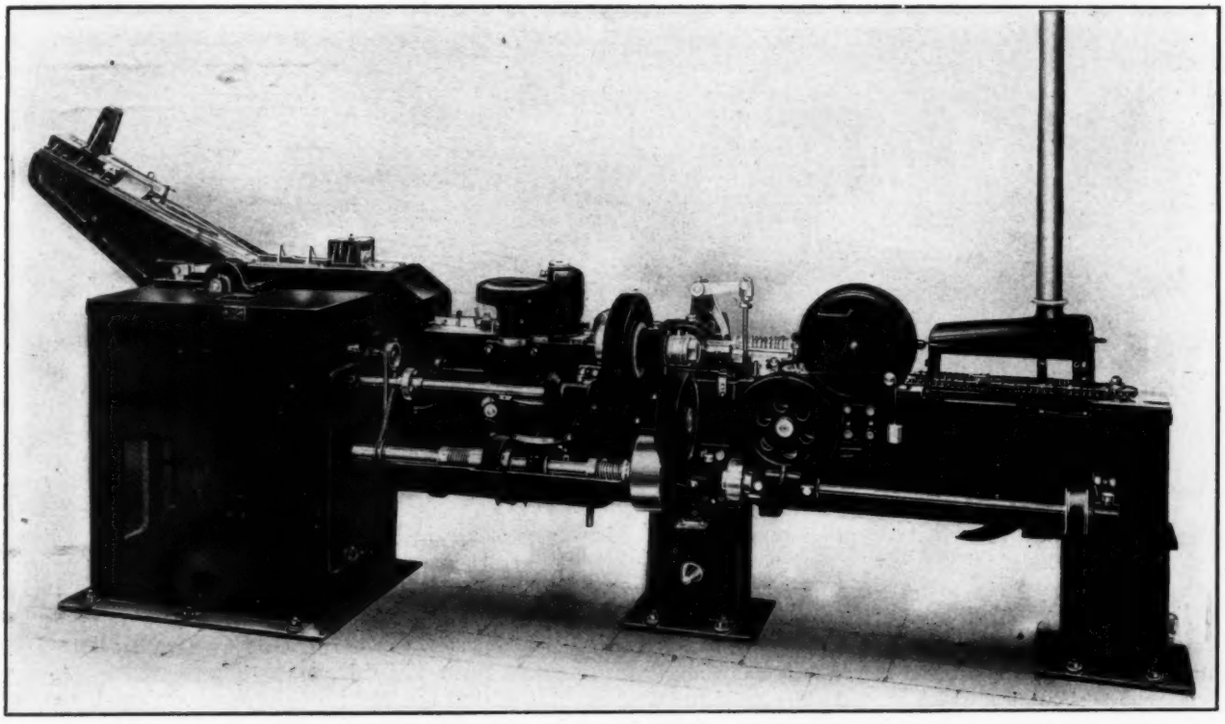


FIG. 5.—AUTOMATIC MACHINE FOR SORTING AND ASSEMBLING SEGMENTS.

KANSAS GAS, WATER, ELECTRIC LIGHT, AND STREET RAILWAY ASSOCIATION.

ANNUAL CONVENTION AT KANSAS CITY, KANS.

The thirteenth annual convention of the Kansas Gas, Water, Electric Light, and Street Railway Association, held at Kansas City, Kans., September 27-28, was one of the best the association has ever held. The various interests of the state were well represented and a programme of twenty-one papers with their discussions fully occupied the two days alloted to the convention. The meetings were held at the Mercantile Club rooms.

The first meeting was called to order Tuesday morning, President Flynn, of Kansas City, Kans., presiding. The address of welcome was delivered by J. A. Cable, commissioner of water works and electric light, and responded to by L. O. Ripley, of Wichita, chairman of the executive committee.

Edwin R. Weeks, consulting electrical and mechanical engineer, Kansas City, Mo., gave a short address in which he outlined the history of the electrical industry in that city. Kansas City was the first town to have an electric light plant using the Thomson-Houston system, and one of the first to have a commercial electric railway. This road made use of a double trolley and operated at a potential of 250 volts.

The president, in a few words, commended the work of the members, thanked them for their co-operation and made a plea for the continued co-operation of all of the interests represented in the association. The secretary's report showed a total of 160 members, the largest membership in the history of the organization.

The Tuesday afternoon session was devoted to the reading and discussion of papers. C. C. Young, of the department of chemistry, University of Kansas, presented a paper on the subject of "Boiler Water Troubles," in which he carefully outlined the various impurities ordinarily found in waters and their effects upon boilers, and dealt with the methods in use for boiler water treatment. Mr. Young cautioned the members against the use of boiler compounds unless they were certain of the composition of the preparation used and were satisfied that it possessed some merit when employed with their particular water supply. Professor Bailey supplemented the paper by stating that users of boiler compounds are being imposed upon continually. During the discussion the details of some of the purification methods in use were described.

H. A. Walker, of McPherson, Kans., outlined the methods of financing a plant in a small town, advocating a stock-selling system.

Prof. B. F. Eyer, of the electrical department of the Kansas State Agricultural College, gave a very interesting presentation of the status of the electric-vehicle business from the central-station standpoint, and the discussion brought out both the early and the later experiences of several of the members in the use of the electric trucks and the furnishing of power for charging electric vehicles.

In a paper on "Prevention of Accidents," Geo. E. Haylor, of Joplin, Mo., stated that some of the most essential things in the prevention of accidents are: good discipline; careful organization; especial care in the selection of foremen, choosing, if possible, men who had actually at some time done work similar to that they are to superintend; and the publishing of sets of simple but fairly complete rules for every department. Next to the prevention of accidents the most important thing is to know what to do in case an accident does happen, and central-station superintendents and managers should see that all employees are instructed along this line, formulating a few rules to be closely followed immediately after the accident. Some statistics were presented, showing that in Germany about forty-two per cent of the accidents are unavoidable, but the author estimated that in this country probably not more than twenty-five per cent of the accidents fall into this class. In the discussion J. C. Nicholson called attention to the probable passage of an employer's liability law by the Kansas Legislature during the coming session, and outlined the probable form such a law would take. On motion a committee was appointed to prepare suggestive rules for the prevention of accidents and distribute them to members of the association. This committee was appointed as follows: J. C. Nicholson, chairman, Geo. E. Haylor, and W. E. Sweezey.

The first paper presented Wednesday morning was that of John G. Pease, Junction City, entitled "Troubles of a Water Commissioner." This paper served to bring out considerable discussion of water rates and the use of meters, and this discussion was continued in the afternoon subsequent to the reading of J. H. Rathert's paper on "Rates for Water Works." The large delegation from the water works present at this convention added to the interest and value of this discussion.

In a paper on "The Co-operation Between Manufacturers and Central Stations," Harry G. Glass, of Pittsburg, Pa., told of the arrangements whereby the extensive data on motor installations and other electrical subjects in possession of the manufacturers is placed at the disposal of the central stations, and of how personal representatives are often sent by the manufacturers to help the central stations in cases of special installations.

P. F. Walker, professor of mechanical engineering at the University of Kansas, read a paper on the "Heating Values of Kansas Crude Oil, Fuel Oil Residues, and Distilled Oils." Owing to the increasing use of oil as fuel in the state of Kansas, this paper proved of particular interest to the members of the association and considerable information additional to that given in the paper was brought out in the discussion.

At the beginning of the Wednesday afternoon session an illustrated talk on Holophane illumination was given by T. C. Hawkins. The various distributions of light which can be obtained by the use of different forms of Holophane globes and shades were well illustrated.

Prof. Geo. C. Shaad, of the electrical engineering department, University of Kansas, reviewed the work which has been done and is now being accomplished by the Railroad Commission of Wisconsin in its regulation and control of the public utilities under the Public Utilities Law of that state. It is quite probable that some law of this nature will be introduced in the Kansas Legislature this year and the progress of other commissions in controlling public utilities is being watched with interest.

"How to Get Motor Business," was the title of a paper read by W. R. Murrow, of Independence, Kans. Among other things, Mr. Murrow advocates keeping a considerable stock of motors, and he makes a specialty of quick installations, claiming that rapid instal-

lations in emergency cases is one of the very best of advertisements for the motor business.

The paper by J. B. Kennedy, Wichita, on "The Advantages of a Sales Department," was read in the author's absence by J. D. A. Cross, Chicago, and the discussion was continued after the presentation of a paper on a similar subject, "Central-Station Methods of Securing New Business," by Mr. Cross.

Under the heading of "The Other Fellow," L. O. Ripley, of the Wichita Gas and Electric Company, gave a very interesting talk on the relation of public utilities to the public, and advocated that the central-station man should put himself in the place of the consumer as an aid to formulating his dealings with the public.

As a committee to canvass for water, gas, and electricity throughout the state the following men were appointed: E. S. Springer, Leavenworth, chairman, A. L. Newman and W. R. Murrow.

Officers for the ensuing year were elected as follows: President, W. R. Murrow, secretary and manager, Independence Electric Company, Independence, Kans.; first vice-president, J. H. Rathert, Junction City; second vice-president, Prof. B. F. Eyer, Manhattan; third vice-president, H. A. Walker, McPherson; secretary and treasurer, J. D. Nicholson, Newton.

Executive Committee: A. M. Patten, superintendent of the Topeka Railway Company, Topeka; L. O. Ripley, Wichita; E. L. Springer, Leavenworth.

GROUP AT THE KANSAS CITY CONVENTION.

The new standardizing equipment of the University of Kansas was briefly described by C. A. Johnson, of the electrical department, and the central stations were invited to avail themselves of the facilities offered by the University laboratories.

E. L. Buchanan, Chicago, read a paper on "Transformers," in which the question of the proper location and loading of transformers was considered, after which he explained some of the more special connections and discussed the question of grounding the neutral.

Papers were also read by J. T. Skinner, Lawrence, and R. E. McDonnell, Kansas City, Mo.

On Tuesday evening the associate members entertained the convention by a theater party at the Grand Opera House and a luncheon at the Elks' Club. Other entertainment features were also furnished.

The next convention of this association is to be held at Independence, the time of the meeting to be fixed later.

Public Lectures in New York City.

In the new season of free public lectures for adults which was opened by the Board of Education in New York City on Saturday evening, October 1, special emphasis has been laid upon technical subjects, such as will appeal to workmen and to students in the technical trades. Of first importance is the course on "Power" to be delivered by Dr. Charles E. Lucke, professor of mechanical engineering at Columbia University, who will give eight lectures on the topic on Saturdays at St. Bartholomew's Hall. His first lecture considered "Mechanical Power and Machinery."

J. Newton Gray will give a course on "Physics" and W. Wallace Kerr is to open a practical course on "Principles and Practice in Electrical Engineering."

High-Power Submarine Cable.

An electric cable to transmit 3,000 horsepower at 11,000 volts will shortly be laid on the bottom of Narragansett Bay between Nayatt Point and Connecticut Point by the Narragansett Electric Lighting Company. The length of the new cable will be over 7,000 feet and it will consist of three conductors having a cross section of 100,000 circular mils each. Each conductor is made up of strands of smaller wire, surrounded by rubber of nine-thirty-seconds of an inch in thickness, sheathed with lead one-tenth of an inch thick, with jute and galvanized wire around the lead.

Copper exports for the week ended September 22 were 8,051 tons. Since September 1, 22,847 tons, against 12,587 for the same period last year.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.

THIRD ANNUAL CONVENTION AT CHICAGO, SEPTEMBER 27 TO 30.

The third annual convention of the Association of Railway Electrical Engineers was held in Chicago, Ill., September 27, 28, 29 and 30. Headquarters were established at the Hotel La Salle, the meetings and exhibits being held in the main banquet hall on the nineteenth floor. A report of the proceedings of the meetings on Tuesday appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for October 1 on page 678.

The meeting was opened with the address of President E. M. Cutting who impressed on the association the value of remaining an independent organization and not affiliating with the Master Car Builders' Association as was suggested by some of the members. The report of the Committee on Illumination was also presented on the first day. This report contained a number of valuable tables and suggestions regarding the proper selection of lamps.

WEDNESDAY'S SESSIONS.

The session on Wednesday morning was opened with the presentation of the report of the Committee on Accounts and Reports. This report was read by F. R. Frost, chairman, and covers a uniform method for calculating and reporting the cost of car lighting.

The committeee has endeavored to devise a standard, simple method of calculating and reporting the cost of car lighting so that comparisons of different systems may be made. When considering dissimilar methods of lighting, all items of expense should be considered. To make such comparison complete, the figures should be reduced to a standard, based on total effective illumination and hours of lighting. The recommendations in reference to reports for general purposes and for comparisons of similar systems embody the following: I. Standard unit; the standard units of cost shall be the car month and the 1,000 car miles, both units being shown. II. Car unit; the car month shall be one car equipped for service for one calendar month. III. Car mileage; this includes all mileage made by a car regardless of service conditions. IV. Costs; this includes supervision, labor, material, charging current required, interest and depreciation on the entire investment, cost of power for operating head-end systems and axle dynamos, cost of hauling the apparatus and insurance and taxes. It was further recommended that reports of costs of maintenance and operation include no allowance for interest and depreciation, for power, for operating head-end systems, for haulage of electrical equipment or for insurance and taxes.

The recommendation regarding interest and depreciation was discussed at some length and it was the consensus of opinion that some method should be arrived at whereby the cost of power for head-end systems could be determined. The method of measuring the amount of fuel consumed by oil-burning locomotives was explained and it was thought that the principles involved could be applied to determining the cost of fuel for head-end systems.

This discussion was followed by a highly interesting address by J. G. Heninger, of the National Electric Lamp Association on "The Illuminometer in Railway Practice." The address was supplemented with a number of diagrams and charts and with an actual demonstration of a photometer.

The speaker first reviewed the various methods for comparing the value of illumination received from various light sources. He explained how the law of squares was employed, the diaphram method, the method of employing a combination of lenses and the smoked-glass method. He pointed out the disadvantages of these methods and compared them with the modern photometer. Mr. Heninger then described the construction and operation of the Sharp-Millar illuminometer. He explained how the instrument could be employed for measuring intensities of lights in cars, in shops, in stations and locomotive headlights. He pointed out the advantages of having accurate information regarding the engineering features of a system of illumination and how this information will lead to better lighting.

Following the address numerous questions regarding the instrument demonstrated were asked. A. J. Farrelly, of the Northwestern Railroad asked as to the precautions which must be taken in operating the instrument.

Mr. Heninger said that the voltage of the miniature lamps used in the illuminometer should be carefully watched as a slight variation would make a noticable difference in the readings. Another precaution to be taken is that the instrument should be carefully checked before and after reading.

Other questions dealt with the battery box, voltmeter and minor points of construction. This concluded the morning session.

During recess a number of the delegates accepted the invitation of the Chicago Electric Club and were present at the regular weekly meeting of the latter organization. A very interesting programme was arranged.

The session on Wednesday afternoon was opened with the presentation of the report of the Committee on Standards. This report was read by Secretary George B. Colegrove. The report is essentially one of recommendation and progress and the results of the adoption of the recommendations of last year's committee were recited. In addition to the report on these recommendations the report embodied further recommendations that have not as yet been adopted.

These recommendations were briefly discussed and the report of the committee then adopted. Following this it was moved that a committee be appointed to confer with a similar committee from the Master Car Builders' Association on matters regarding standardization in train lighting.

The report of the Committee on Data and Information was next read by D. J. Cartwright, chairman.

This committee communicated with a number of railroads with a view of compiling data regarding train lighting. Replies were received from twenty-six roads and the information received was classified as follows: The roads from which replies were received operate a total of 3,629 cars equipped for electric lighting. Of this number 2,316 were equipped with the axle-generator systems and 1,313 were equipped with the straight storage battery system operating at sixty-four volts. Of the cars equipped for axle-generator service 1,800 were of the thirty-two-volt system and 500 of the sixty-four-volt system. The committee further reported that blanks asking for further information are being prepared and will be sent out to all the roads so that more data can be presented at the next meeting.

An excellent paper entitled, "Ventilation of Railway Cars," was then presented by B. A. Stowe, chief engineer, Jandus Electric Company, Cleveland, O. An abstract of this paper is presented herewith.

CAR VENTILATION.

Mr. Stowe's paper was a forceful exposition of the scientific requirements for pure air in passenger coaches. At present scarcely any attempt is made to remove the foul air from such coaches, which nowadays frequently seat eighty passengers and contain a free space of about 4,800 cubic feet. Medical authorities prescribe a clear space of 600 cubic feet and a supply of 3,000 cubic feet of pure air per hour for each adult person. As the prescribed requirement cannot possibly be met in a necessarily compact car, it is imperative to provide forced ventilation, as that resulting from the movement of the train is too unreliable. The need for ventilation is greatest when the train is at a standstill and passengers entering the car are most cognizant then of the impure condition of the air within it. The sense of smell gives us usually a guide to the presence of marked impurities in the air; a feeling of lassitude and drowsiness shows excess of carbon dioxide; we have no way, however, of readily detecting the presence of disease germs with which the air may be laden. Even country air carries frequently over 200 dust particles per cubic centimeter, while in city air the number is often 150,000 and in crowded tenements even 1,000,000 per cubic centimeter. As an effective means of improving the intolerable conditions in rail-

way cars, Mr. Stowe suggested the use of nine-inch direct-current exhaust fans placed in the back of the deck sash and communicating with discharge flues carried over the car roof. These fans should be wired on two multiple circuits, one on each side of the car so that either or both sets of fans may be used to suit wind and smoke conditions. Such a fan could displace 530 cubic feet per minute, whereas a twelve-inch fan could exhaust 1,100 cubic feet per minute. Lack of room may prevent the use of the larger fan, however. Such a system should not be confined to Pullman and first-class cars only, but should be put on every car equipped with electric service. Besides the exhaust fans referred to, which would be used for ventilation regardless of the season, Mr. Stowe would provide several electric oscillating fans to agitate the air when it becomes oppressively close in summer. He gave a scientific explanation of the cooling effect of the breeze from an electric fan. In conclusion he stated that the time is coming when both the exhaust and oscillating fans will be required and that adequate ventilation will be regarded as essential as adequate lighting of railway cars.

After a brief discussion as to the method of admitting pure air into the cars after the foul air had been removed by means of exhaust fans the Association extended to Mr. Stowe a vote of thanks for his paper. This concluded the day's meetings.

THURSDAY'S SESSIONS.

The session on Thursday morning was opened with an extemporaneous address on the subject of "Ventilation," by William H. Lynch. The speaker endorsed many of the points brought out by B. A. Stowe in his paper on the same subject presented at the Wednesday afternoon session. Mr. Lynch spoke of several experiments he had carried on both in this country and Canada with screened openings to admit fresh air. He was of the opinion however, that the present system of ventilation both in buildings and cars was not correct. He advocated the use of windows to admit fresh air instead of admitting it in the basement, as in the case in buildings, and then forcing it to the various locations desired.

This address was followed by the presentation of a paper by S. F. Nichols entitled "The Electric Operation of Drawbridges."

THE ELECTRICAL OPERATION OF DRAWBRIDGES.

Mr. Nichols, in his paper, brought out the reasons why steam engines and gasoline engines were unsatisfactory for the operation of drawbridges. With the steam engine, it is necessary to keep up steam pressure at all times in order that a bridge may be drawn perhaps only a few times a day. Gasoline engines are but little better, for the engine must be kept turning over at a slow rate of speed and the fuel consumption per opening is high. As the engines are not reversible and will not start under load, a system of clutches is necessary.

The development of the series-wound reversing electric motor, however, placed an ideal source of power at the bridge engineer's disposal. Electric motors may be placed on the most convenient parts of the bridge, while the operator is in such a position that he can easily watch traffic. The motor is light, compact, easily reversed, and will for a short time carry an exceedingly heavy load.

A modern motor-equipped bascule bridge uses a number of motors for its operation. One and sometimes two motors operate the moving leaf, a motor operates the front lock, and in some cases a motor is used to operate the rail lock. The motors on the moving leaf are equipped with an emergency brake, which is automatically operated by a failure of the current. The bridge is thus held open if anything interrupts the current supply. To prevent accidents due to improper operation, interlocking systems have been devised.

In closing, Mr. Nichols dealt with the lighting of the bridge, the desirability of small isolated power stations and finally gave a description of the swing bridge over the St. Louis River at Duluth, Minn.

At the afternoon session J. R. Cravath delivered an address on the subject of "Illumination."

Mr. Cravath spoke briefly regarding the principles of illumination and explained the term lumen, as used in illuminating engineering, a lumen being a unit of light flux. In providing an efficient system of illumination there are a number of things to be considered. The first is the measured efficiency that is the ratio of the light generated by the lamps to the light received by a plane where it is wanted. The second consideration is the physiological efficiency. Under this heading the most important factor is glare. The speaker referred to glare directly from a lamp and glare from the reflection of light on an article such as glossed paper, and mentioned the bad effects of these conditions. He also spoke of contrast in lighting and demonstrated how this can affect the efficiency of a lighting system. The third consideration is the human element. Under this comes the question of maintenance. Mr. Cravath was of the opinion that opal glass shows dirt quickly but may be very easily cleaned. The speaker then, by means of diagrams, indicated the positions of lamps in railway cars and described the several methods of placing lamps with proper reflectors to obtain the best results.

The discussion was opened by J. R. Sloan who asked in which plane should measurements be made to determine the efficiency of a system. Mr. Cravath replied that measurement should be made both on the horizontal plane and the working plane.

D. J. Cartwright asked whether better results are obtained by placing the lamps over the rows of seats or along the center of the car. Mr. Cravath replied that it depended upon the reflectors used.

F. R. Frost said that the advertising department of a railroad generally demanded that the cars present a bright effect when standing at platforms and he asked if this would not be impossible where proper reflectors were used. Mr. Cravath said that probably enough light could escape through the reflectors to light the surrounding platform.

This discussion was followed by the presentation of the report of the Committee on Train-lighting Practice.

This report, which was read by F. R. Frost, covers in a complete and comprehensive manner the subjects of head-end practice, axle-lighting practice and storage-battery practice. The committee collected data from every possible source and its report contained many tables and diagrams which illustrate the most modern practice in train lighting.

FRIDAY'S SESSION.

The session on Friday morning was devoted to a selection of the next meeting place for the semi-annual and annual meeting and the election of officers.

An invitation from the Washington Terminal Company, Washington, D. C., was read and it was decided to hold the semi-annual meeting in Washington. Chicago was decided on as the place for the next annual meeting and the time is to be decided by the Executive Committee. However it was agreed that it be early in November.

The election of officers resulted as follows: J. R. Sloan, Pennsylvania Railroad, president; F. R. Frost, Santa Fe Railroad, first vice-president; D. J. Cartwright, Lehigh Valley Railroad, second vice-president J. Andreucetti, Chicago & Northwestern Railroad, secretary-treasurer.

EXHIBITS.

As mentioned in our issue last week, the Railway Electrical Supply Manufacturers Association spared no expense in providing a most elaborate exhibit that brought forth the highest praise of all in attendance.

An interesting feature of the exhibits was the demonstration of the automatic enunciator manufactured by the Automatic Enunciator Company. The hall was equipped with these devices and in making announcements throughout the convention this device was resorted to.

The following is a partial list of exhibitors with a description of their exhibits:

The Adams & Westlake Company showed many types of dry batteries and railway supplies, particularly adapted for railway car-lighting.

The American Pulley Company, Philadelphia, Pa., exhibited a complete line of pulleys designed for car-lighting service.

The Baird Electric Company exhibited the Baird telephone train-dispatching system in all of its details, and in addition had a complete line of separate telephones, switchboards and auxiliary apparatus on display. The telephone system was shown in operation and the method of dispatching trains by telephone pointed out.

The Benjamin Electric Company exhibited a complete line of reflector sockets for

all sizes of tungsten lamps from twenty-five to 500 watts. Also a line of train-shed and outdoor tungsten fixtures, "Benco" sockets and fiber-insulated, portable lamp guards. The company was represented by H. E. Watson and G. C. Knott.

The Central Electric Company, Chicago, Ill., had an interesting exhibit of Okonite wires and cables, Columbia incandescent lamps of all sizes, D. & W. fuses, Diehl car fans and several specialties of peculiar interest to car-lighting men. Among the new things shown were "BX" flexible conduit made up of Okonite conductors and also the new 400 and 500-watt Mazda lamp. Particular interest was shown in the new type of Diehl blower fans for dining-car service. The company was represented by J. M. Lorenz, L. G. Martin, G. M. Fox, H. Woodhead, and C. D. Oldham.

The Commercial Acetylene Company distributed literature bearing on the subject of train lighting by acetylene gas for auxiliary service.

The Consolidated Railway Electric Lighting and Equipment Company exhibited a line of axle pulleys of all sizes, axle generators, generator parts and regulator panels. All of this apparatus was shown assembled and disassembled for inspection of the various parts.

The Crouse-Hinds Company made an elaborate exhibit of receptacles, rosettes, sockets, various types of switches, panel boxes and a miscellaneous assortment of apparatus of particular interest to car-lighting men.

The Cutter Company, Philadelphia, Pa., exhibited several types of I-T-E circuit-breakers. These were shown operating under various conditions and the functions of each type were demonstrated. In addition the company distributed photographs and literature bearing on recent installations of these circuit-breakers. The company was represented by C. E. Wise.

The Edison Storage Battery Company exhibited the Edison battery assembled in three different types for car-lighting purposes. A feature of the exhibit was a sample board showing the entire development of the battery from the raw material to the finished product. The company was represented by H. G. Thompson.

R. and J. Dick, Ltd., Passaic, N. J., exhibited a full line of train-lighting belts and samples of Balata lamps.

The Electric Storage Battery Company, Philadelphia, Pa., had on display various types of car-lighting batteries, "Chloride Accumulators," "Tudor Accumulators," portable batteries for signal work and several types of two-cell units used on several of the railways. In addition the company had on exhibition a complete line of battery parts, plates, etc. The company was represented by G. H. Atkin and H. E. Hunt.

The General Electric Company exhibited a complete line of Mazda lamps for car-lighting, ranging in size from 15 to 500 watts. A feature of the exhibit of this company was the drawn-wire Mazda lamps for car-lighting service. Samples of these lamps were distributed to active members. The company was represented by Henry Schroeder.

The Gould Companies exhibited Gould storage batteries, various types and sizes of Gould couplers and various apparatus manufactured by the companies for car-lighting work.

The Heany Electric Sales Company exhibited a complete line of Heany tungsten lamps, and Heany pure asbestos fireproof magnet wire. The company was represented by Ray P. Lee.

The Jandus Electric Company, Cleveland, Ohio, exhibited standard bracket fans for railway-car service, also a line of exhaust fans and twin oscillating fans with interchangeable bases. The company was represented by B. A. Stowe, assisted by W. L. Comisky and C. W. Beach.

The Luitweiler Pumping Engine Company had on exhibition a working model of its electric pump for railway purposes. The company was represented by Mr. Williams.

The New York Leather Belting Company exhibited a full line of belting and belting samples for car-lighting work.

The National Electric Lamp Association, Cleveland, O., showed a complete line of high-efficiency incandescent lamps. The Mazda types included the regular round and medium bulb for both 220 and 110 volts in sizes ranging from sixteen to 500 watts. The low-voltage lamps embraced the regular train lighting and miniature lamps. A new and interesting feature of the exhibit was the display of Mazda drawn-wire lamps shown principally in train-lighting sizes. There was also a full line of tantalum lamps of all sizes shown. Those in attendance included C. W. Bender, H. J. Raymond, and S. J. Banks, representing Fairbanks, Morse & Company, distributors for the Monarch Incandescent Lamp Company.

The Oneida Steel Pulley Company exhibited a complete line of steel pulleys in various sizes for auxiliary lighting work.

Pyle National Electric Headlight Company had on exhibition a standard electric headlight which was shown in operation during the convention.

The Safety Car Heating and Lighting Company exhibited regulator panels, axle generators and an elaborate display of fixtures and brackets for car-lighting. Also a miscellaneous assortment of accessories.

The Tipless Lamp Company, New York, N. Y., showed its type G-18 tipless tungsten lamps in units of twelve, sixteen and twenty-candlepower. The company was represented by R. S. Carrick.

The United States Light and Heating Company showed a Moskowitz thirty-volt generator, thirty-watt regulators and sixty-volt regulators, Bliss type "O" thirty-volt, forty-ampere generators, with standard Pullman generator regulators, a complete line of National battery plates and miscellaneous supplies. A feature of the exhibit was the new chain oiler demonstrated for the first time. The company was represented by J. Allen Smith, W. P. Hawley, and W. F. Bower.

The Watson Insulated Wire Company exhibited a complete line of Kerite wires and cables, samples of crude rubber, and literature bearing on these products.

The Western Electric Company, Chicago, Ill., exhibited interphones for railway shops and offices, a number of Mazdaliers, Hawthorn flaming arc lamps, and a full line of Mazda lamps for train-lighting service. The company was represented by G. H. Porter.

The Westinghouse Electric & Manufacturing Company exhibited a complete line of wire type tungsten lamps shown in sizes ranging from fifteen to 500 watts. A feature of the exhibit was a case in which were shown the several parts that enter into the manufacture of tungsten lamps, including ores and salts of tungsten. There was also an exhibit of tungsten filaments up to seventy feet in length. The company was represented by T. J. Wahling, B. F. Fisher, Jr., J. M. Schilling, R. F. Moon and L. M. Pyle.

The Willard Storage Battery Company exhibited a complete line of standard batteries and battery parts. The company was represented by T. A. Willard, R. Norberg, W. E. Ballentine, and L. Sears.

Anglo-Japanese Exhibition.

An Anglo-Japanese Exhibition will be held at Rusholme, Manchester, England, November 26 to January 21 next.

RADIOLOGY AND ELECTRICITY.

REPORT OF THE INTERNATIONAL CONGRESS AT BRUSSELS.

The International Congress of Radiology and Electricity was held at Brussels, September 13, 14 and 15, and was presided over by Professor De Heen, of Liége University. Scientists from all parts of the world were present, and many valuable papers were read dealing with radioactivity, Roentgen rays, and electrical subjects. Among the papers presented, the following are worthy of note:

E. Rutherford presented a

REPORT ON RADIUM STANDARDS.

It would be of high utility to adopt an international standard of radium; two processes now permit the easy measurement of radioactive bodies, the gamma-rays method and the emanation method and two standards would be necessary; a determined quantity of pure radium (two or three milligrams) contained in a sealed tube would be used for the preparation of secondary standards in the gamma-rays method; a solution of pure radium (containing 10^{-6} milligrams per cubic centimeter) would be used for the emanation method; the preparation of the standards (fundamental and secondary) would be carried out by a central committee.

A paper was read by P. Lenard, entitled

RADIOACTIVE MEASUREMENTS AND UNITS.

The author thinks that most perfect measuring instruments now available are the emanometer described by Professor Becker, for use in the emanation method, and the decadometer, as built by Dr. C. Romsauer, by means of which the curves of decay are traced; such instruments are used at the Radiological Institute; their use should render it possible to define practical units.

THE EMANOMETER.

was described by A. Becker.

The apparatus is formed of an electrometer and a vessel, connected with each other by means of a rubber tube; the electrometer is of the quartz-fiber type; it is surmounted with a cylindrical condenser containing a central stem connected to the quartz fiber; a little electromagnet permits breaking this connection. The vessel is filled with a given volume of the liquid to be measured, and then sunk in a water basin; the cocks, at the bottom of the vessel, are then opened, the radioactive gas being so let into the electrometer, where it acts upon the quartz fibers; when the vessel is entirely filled with water, a contact is established in said vessel, so closing the circuit of the electromagnet, which in turn breaks the electrical connection between the fibers and the stem of the condenser; in order that the induced activity should not introduce errors, the emanation is forced through an electrical field; for the same reason, surfaces where this induced activity could deposit are reduced to a minimum and the stem is charged to a convenient potential. The dimensions of the emanometer having been fixed, it would be easy to define a unit; this emanation unit would be the quantity contained in a liter of water giving a fall of one volt in the emanometer.

This was followed by a description by C. Ramsauer of

THE DECADOMETER.

The principle involved is the automatic comparison between the saturation current to be measured and a current through an air resistance under a given pressure. The external casings of the activity apparatus and of the comparison chamber are connected respectively to a 200-volt battery and to earth, the internal electrodes of said apparatus being connected with each other and to the electrometer; switches are provided in order that the connectors should easily be commutated or broken and the radioactive body is introduced in the activity apparatus; the electrometer is fitted with a microscope and an automatic registering device. S being the saturation current in the activity apparatus, v the voltage at the electrometer, and i the current in the comparison chamber, v will go until $i = S$; V being the corresponding voltage as measured at the electrometer. We shall have: $S = f(V)$ and $i = f(v)$. The air resistance is maintained between limits where Ohm's law holds, and the resistance measured, so that $S = V/R$; from these relations may be deduced the time T, which is necessary for V to be attained. The automatic recorder registers the curves of decay.

B. Szilard described an apparatus for the

MEASUREMENT OF X-RAYS.

The principle is to discharge a condenser and to measure the residual charge; the condenser is formed by the apparatus itself and is charged by means of a small Ruhmkorff coil, fitted with a valve so as to be unipolar; the discharge takes place in an ionization chamber, in the vicinity of the X-ray apparatus, and connected to the instrument by means of a wire mounted on insulators made of hard rubber. A small needle mounted on a pivot and submitted to the directive action of a horseshoe magnet, serves as an indicator; it is fitted with an aluminum pointer. The author proposes to use as a radiation unit the quantity able to produce one million ions in the receiver having one cubic centimeter capacity; this unit he calls a mega-ion. Calibration of the instrument would be made by means of uranium oxide.

W. Duane presented a paper entitled

ENERGY OF RADIUM RAYS.

After negative trials with a bolometer, a radiometer and a thermo-couple, the author has obtained interesting results with a differential air thermometer and a calorimeter; with the air thermometer the measurements were not completed; with the calorimeter the author has observed that the beta and gamma rays exert no visible effect, while the alpha rays carry with them a quantity of energy which can be measured even at the end of their travel. He hopes to be able to measure this energy along the path of motion.

In a paper by Makower, Russ and Evans, it was shown that radium B carries the atomic charge of electricity, whereas the alpha particle from radium A carries twice this charge.

A. W. Conway read a paper entitled

THE THEORY OF THE CONDUCTING ELECTRON.

Some phenomena seem to indicate that the electron does not possess such a simple combination as was assumed by Abraham and Bucherer; the author reports on requirements made at the Royal Irish Academy in order to study the possibility of more complex electrons.

H. Geitel presented a paper upon "Photoelectric Sensibility of Minerals."

PHOTOELECTRIC SENSIBILITY OF MINERALS.

Elster and Geitel observed long ago the photoelectric sensibility of vanous minerals. Taking into account similar facts observed by Goldstein and Geitel on the photoelectric sensibility of bodies submitted to radium or cathode rays and the work of Siedentorpf, they now explain the phenomenon by the exposure of said minerals to radioactive substances in the soil.

C. G. Barkla delivered a paper entitled

X-RAYS AND MATTER.

The transmission of Röntgen rays through matter is much simpler than is generally believed; each element, when submitted to X-rays has a characteristic spectrum of radiations excited by the primary radiations; when the spectrum has been recognized, it is easy to foresee the X-ray phenomena, the properties of light and X-rays are similar.

A paper by W. Wien was entitled

POSITIVE AND NEGATIVE IONS IN CANAL RAYS.

A study of the electric and magnetic deviation of positive and negative ions in oxygen, hydrogen, nitrogen and iodine shows that both kinds of rays consist of ions in motion. Mercury and hydrogen act on oxygen in such a way that the production of positive ions is accelerated; no effect of this kind is observed with nitrogen; with iodine, the positive rays are much stronger than the negative ones.

W. H. Bragg read a paper dealing with ionization.

IONIZATION BY X-RAYS AND BETA RAYS.

The ionization is not a direct effect, but an indirect one and it is possible to determine the length of travel of the beta and cathode rays in metals.

The title of a magnetic paper by P. Weiss was

DIRECT DETERMINATION OF THE MOLECULAR FIELD.

The hypothesis of the molecular magnetic field is very convenient for the calculation of the phenomena in the ferromagnetic media, although it is not sufficient for the exact representation of the properties of the magnetic metals; the author has tried to improve the method and has arrived at a process by means of which the molecular field may be generally calculated.

C. E. Guye also presented a paper dealing with magnetization.

RELATION OF MAGNETIZATION TO FREQUENCY.

The current of a high-frequency alternator (300 to 1,200 cycles), is sent through the winding covering a ring of 0.04-millimeter iron wire; a thermo-ammeter measures the current; a secondary winding, made of manganin, is connected to a Wulf quartz-fiber electrometer; in this way the only magnetic action is due to the primary current. The secondary winding is divided in four parts, which are connected in the following way: for a frequency 300, four parts in series; frequency 600, two parts in series; frequency 1,200, all in parallel; it is shown that the deviation at the electrometer is equal for all frequencies.

A paper on "Electrostatic Measurements" was presented by S. Pienkowski.

ELECTROSTATIC MEASUREMENTS.

By measuring the repulsive forces between the parts of an electrified body, the author has recognized that the electrostatic theories based on the formula $F = 2\pi\sigma$ for the electrostatic tension are not in accordance with reality; the electrostatic forces are not perpendicular to the surface of the conductor; De Heen's theory seems more correct.

A. Korn described the transmission of photographs and reported upon the various processes of telephotography now in use. Trials are being made between Berlin and Paris with recorders, permitting a photograph 13 by 18 centimeters to be transmitted in twelve minutes.

A paper was presented by R. Goldschmidt describing an apparatus for generating sustained waves.

LIQUID-ELECTRODE GENERATOR OF SUSTAINED WAVES.

The arcs are produced between two jets of mercury crossing at right angles in two parallel planes; the arcs are inclosed in a tube which may be filled with neutral gas (nitrogen, for instance); the liquid is set in continuous circulation by means of a pump; the electrode surfaces being always fresh and cold, the waves generated are perfectly steady; this process is consequently very convenient for the transmission of speech. Trials are now in progress with such an apparatus in which the mercury jets are submitted to the control of telephone diaphragms connected to a circuit including a microphone transmitter; the diaphragms, whose vibrations are excited by the currents which the transmitter controls, carry the tubes through which the mercury is ejected; the flow is thus modified in accordance with the sound vibrations acting upon the transmitter.

H. Guilleminot read a paper upon "The Effect of the New Radiations Upon Plants," in which attention was called to the influence exerted by alpha, beta, gamma and X-rays upon the vegetable cell. The author has shown that the action of X-rays upon a seed is similar to that of light, a destruction of the germ by oxidation.

A paper by P. O. Pedersen on "Ressonance in Coupled Oscillating Circuits" was a mathematical study not susceptible of being abstracted.

On the motion of Professors Rutherford of England and Duane of the United States, it was decided to constitute a grand committee, charged with the detailed investigation of the choice and preparation of primary and secondary standards in connection with radium and the determination of the price of such standards. It was finally resolved that Mme. Curie, who was present at the Congress, should prepare a standard of twenty milligrams at

the expense of the International Commission on Radiology, this standard to be deposited at Paris in the laboratory of Mme. Curie. In accordance with this standard the Commission would then cause the secondary standards to be distributed to the affiliated laboratories. It was further decided that a standard measurement should be created to fix the amount of the emanations, and it was resolved to call this standard a "millicurie."

The congress appointed an International Commission constituted as follows: *Physics and chemistry*—Mme. Curie, Messrs. Rutherford, Werschaffelt, Van Aubel, Righi, Wien, Exner, de Heen, Boltwood and Daniel. *Medical sciences*—Messrs. Dean, Butchers, Bergonie, Lester, Leonard, Lutwig, His, and Bayet.

Utilizing Black Smoke.

In Brussels, Malines, and other Belgian towns, says the *Engineer and Iron Trades Advertiser*, a novel method of not only getting rid of smoke, but turning it to good account, has recently been employed. The smoke is driven by a ventilating fan into a filter filled with porous material, over which a continuous stream of petroleum, benzine, alcohol, or some liquid hydrocarbon flows. The result is that the smoke is entirely suppressed, while the filter yields a gas of great heating power, which can be used for domestic purposes and for driving gas engines. The filtering material itself also becomes a good combustible during the process.

Livery Company to Use Electric Power.

The Denver Omnibus and Cab Company has undertaken to electrify its establishment and will use a total of 150 horsepower in three-phase current, including feed grinders, clipping machines, elevators, etc. A transformer room has been provided in the company's building, where 2,200-volt current is stepped down to 220 volts for power purposes. A three-wire 220-110-volt lighting system is used.

Electric Pumps for Waterworks.

The new Leeper Park pumping station for the waterworks at Mishawaka, Ind., which is now nearing completion, will employ electrically driven pumps which will increase the daily output of water to 18,000,000 gallons.

THE FUTURE OF THE CENTRAL STATION.[1]

BY THOMAS E. MURRAY.

When the first central stations were started in the early eighties, the field of immediate commercial application for the electric current was limited to electric lighting. In fact, the earlier stations were divided into two clearly defined classes; those for arc lighting and those for incandescent lighting and in the period 1882-1884 the attempts to supply the two kinds of illumination from a common distributing system were not commercially successful. The design of the stations and the types of steam machinery and of the generating and distributing apparatus were radically different in the two kinds of stations and incandescent-lighting service from arc stations achieved as little extension as arc-lighting service from the incandescent-lighting stations.

The introduction of the multiple arc lamp in 1886 brought about a co-ordination of the two forms of lighting, and the development of the electric motor, about the same time, for operation on constant-potential circuits, made the operation of light and power service practicable from a common distributing system.

The joint operation of electric trolley roads and electric lighting systems from a common station was of course always entirely practicable as far as steam supply in common was concerned, and the joint use of the same engine was also practicable to a certain extent, but the fact remains that, speaking of the period 1890-1895, joint stations for electric lighting and electric-trolley service were unusual in this country and not common practice abroad.

A step in the evolution of the central station was made possible through the development of the polyphase system of alternating-current generation and distribution, but the central station had to await the appearance of the rotary converter before it could avail itself of the new potentiality for expansion.

ELECTRIC LIGHTING.

Electric current was sold at first on a lamp-hour basis, then by the ampere-hour, and is now generally sold on a kilowatt-hour basis. The lamp-hour basis was logical at a time when practically all incandescent lamps were of a uniform efficiency and represented a fairly definite unit of illuminating value. Today these conditions no longer prevail and we have different efficiencies in the several sizes of carbon lamps and still wider variations resulting from the introduction of Gem, tantalum and tungsten lamps. The lamp-hour unit is rendered of still less commercial applicability when applied to current for arc lamps, flame-arc lamps and mercury-vapor lamps. But, in going over to the new and now almost universal kilowatt-hour basis of charge, the lighting companies voluntarily handed over to the consumer all of the advantages accruing from improvements in lamp efficiency, leaving to the station only the advantages accruing from the extension of its business. Where the improvement in efficiency was so great, as in the case of the tungsten lamp, it was to be expected that there would result a reduction in the current sales. The tendency to immediate and large reduction in the output was limited in its effect only by the restraining influence of the higher cost of the new lamps, but this retarding influence was diminished by the liberal lamp-renewal policy pursued by the central stations. The result has been, in some cases, a reduction in the kilowatt-hours sold, and in many cases a lessened rate of increase in the output.

It is true that in many cases, notably stores, where the saturation point of intensity of illumination has not been reached, the tendency has not always been to reduce the current consumption to a minimum, but in part toward an increased quantity of light. There is evidence now of an improvement in the conditions and the ultimate effect cannot fail to be a marked growth in the lighting business. The ultimate effect on the central stations will be altogether beneficial, due to the lowered cost of the service to the consumer and to the great improvement in the color of the new illuminants, and there is every prospect that metal-filament lamps will, in the future, be less fragile, and will have a longer life.

The effect on the station business of new developments in the arc-lighting field, such as the flame-arc lamps, metallic-electrode lamps and mercury-va-

[1] Presidential address at the twenty-sixth annual meeting of the Association of Edison Illuminating Companies, Frontenac, N. Y., September 6, 1910; abridged.

por lamps has not been notable, although there is a distinct tendency to displace the reliable but inefficient inclosed-arc lamp by single high-candle-power tungsten lamps or clusters of smaller lamps. Where such a substitution has taken place it usually results in a reduction in the current consumed by the installation, of from 25 to 50 per cent.

The improvements referred to have made possible the entering of a field which electric lighting companies have always coveted, minor-street illumination. The high load-factor of this service makes it particularly attractive, although the high investment costs and the political complications which often jeopardize the permanency of the special investment necessary, may act as a deterrent. The stations are fully alive to the vast possibilities for extensions which purely residence lighting presents, with its long-hour use of the maximum demand.

In the lighting field the industry can look forward with confidence to a broadening of its activities and to a vigorous and healthy growth, as the saturation point of supply to a given territory is far from having been reached and the extent of territory which it is commercially practicable to serve is continually expanding.

ELECTRIC POWER.

The ever widening range of commercial applications of the electric motor and the increasing appreciation of its efficiency, economy and convenience, have produced an enormous increase in the station output delivered to power users, and the possibilities of further expansion in the supply of power appear to be without limit, new applications for the electric motor being developed daily.

The station power business is developing at an increasing rate as compared with the lighting business and the reduction in rates to large users made possible by reduction in operating costs under the favorable load-factors of this service, have provided a wide field of extension for power service. The wholesale customer in factory, loft and office building, with his extensive electric elevator installations and individual and group motor-drive to all kinds of manufacturing machinery, has represented one limit of the field, while the householder with his automatic elevator, vacuum cleaner, electric fan, washing machine and other minor household applications, has occupied the other limit, and in both directions the prospects for expansion seem to be excellent.

It is a common observation in cities located on the water front, where there is considerable shipping activity, that provisions for the handling of freight and merchandise are either entirely wanting or they are of a very primitive character. As a striking example, the New York City water front along the North and East Rivers may be cited. Here, notwithstanding continued active canvassing and concentrated effort in the direction of stimulating the installation of efficient and economical hoisting and conveying apparatus, the response has been very slow, and far behind the rate of improvement manifested in any other direction of power application. A notable improvement, however, has been manifest within the last year. In European shipping ports this service is splendidly taken care of by extensive harbor works, which include not only commodious modern fireproof docks and piers, but adequate provision for cranes, hoists and conveying apparatus of all kinds, controlled either by a comprehensive compressed-air distribution or by distributed electric power.

The application of electricity to the operation of city pumping stations, high-pressure fire service, the electrification of railroad terminals and the operation of trolley lines and subway systems, are but a few of the many directions in which central-station power service may be extended.

Electric welding, electric rock drills and percussion tools, electric hoists for building construction, all represent still undeveloped fields of application for electric power.

A direction of expansion in the service, presenting large possibilities, is the sale of current for the charging of storage batteries, especially in connection with heavy trucks and light delivery wagons, as well as the several types of pleasure vehicles. In this connection a difficulty presents itself, namely, the provision of proper garage and repair and maintenance facilities. While it is practicable for very large users, such as great department stores, to maintain properly equipped garages of their own to take care of delivery systems involving fifty to one hundred or more vehicles, and providing for competent, expert supervision in the handling of the batteries and electric equipment of the vehicles, such thorough-going maintenance is not available through the ordinary garage. This difficulty is emphasized in connection with the maintenance of the batteries themselves, which cannot be put in the hands of the ordinary mechanic and much less in the hands of the layman and, in order to obtain the best results in the life of the battery and daily mileage, the batteries must be operated under the watchful care of an expert. It is probable that, as batteries become cheaper and of reduced weight for a given capacity, there will be a large expansion in the business of charging storage batteries and it may become necessary for the central stations to finance and perhaps even operate garages at convenient points in their territory.

ISOLATED PLANTS.

If the economic theory on which the existence of the central station is predicated, is sound, then there should be no room for private plants in our large cities, excepting under very unusual conditions. It is absolutely essential to the success of the station that it should be in a position to compete successfully with the isolated plant, and the extent to which they flourish and increase in numbers is an index of unfavorable operating conditions on the part of the station, or lack of flexibility in its rate schedules.

Large factories and industrial establishments having mechanical help and requiring steam for manufacturing as well as heating purposes, present a problem calling forth all the resourcefulness of the station manager. While it may often be difficult, under adverse conditions, to make out a case and to enable a rate to be quoted that is sufficiently low from the standpoint purely of the cost of the service, yet the value of the added income, the favorable effect of the increased output, the improvement of the load-factor and widening of the diversity-factor, are all elements of advantage to the station which should be considered before the business is turned down. Central-station service can be expanded through the elimination of the isolated plant and the successful station will pursue a vigorous and aggressive policy toward the assimilation of this class of business.

ELECTRIC HEATING.

This field is full of promise and capable of large extension. The household heating appliances in use have been confined to small objects, and while they do not amount to much as far as current consumption is concerned, they constitute, on account of their great convenience and effectiveness, a very important incidental advantage of central-station service.

NEW APPLICATIONS.

Attention has frequently been called to the importance of the load-factor in station economics and the statement has often been made that as much as twenty-five per cent of the station capacity is used less than 100 hours per year, these hours occurring within a period of about three months. How to actively employ the idle generating and distributing apparatus throughout the year, filling out the valleys of the daily and yearly load curves, is a subject which has engaged the best thought of central-station managers for a long time past.

The requirement that such demands should be in the immediate vicinity of the station had formerly to receive careful consideration, but with the extension of high-tension transmission this limitation need no longer be imposed. Such applications as the salt industry in Detroit and some copper refining and other electrolytic processes elsewhere are examples in point, but on the whole no important industry has yet appeared that could utilize that valuable potential by-product of the station—off-peak generated current.

The proposition of combining the manufacture of artificial ice with station service is not a new one and the advantages resulting from such a combination have received consideration both from the engineering and the commercial side. That the possibilities have been properly appreciated particularly in the case of our large cities and prosperous communities may admit of some doubt.

The conditions which determine the best location for an ice-making plant are not dissimilar from those that receive consideration in determining upon a favorable site for a central station. The power required for the operation of the plant and the handling of the ice on a large scale is about fifty kilowatt-hours per ton of ice. To supply New York and immediate vicinity with all the ice it consumes, would require an energy consumption amounting to something like 250,000,000 kilowatt-hours per year. The station capacity required would be about 50,000 kilowatts, or a demand during the months of heavy lighting and power load, of about 8,500 kilowatts. This could be reduced to zero during the lighting peak of two or three hours in the winter months by the provision of a small brine storage capacity.

The daily load-factor of such an ice-plant would be very high and would notably increase the load-factor of the station supplying it with electric power to drive the ammonia compressors, pumps and cranes.

It would appear therefore that the power necessary to operate the ice plant could be obtained with a very small extra central-station investment and at a very low production cost. Neglecting the small extra station investment it is estimated that the cost for current, if figured at one cent per kilowatt-hour, would represent about 60 per cent of the total operating expenses of the ice-plant (excluding all interest on investment, depreciation and fixed charges), and at one-half cent per kilowatt-hour the cost of current would represent approximately 40 per cent of the operating cost of the plant.

It has been estimated that the total ice consumption in the United States is now approximately 35,000,000 tons per annum of which 25,000,000 tons is natural ice and 10,000,000 tons machine-made ice.

Statistics for the city of Cincinnati show that of the total ice consumption in the year 1889, 76 percent was of natural ice and 24 per cent machine-made ice, while in the year 1905 only 10 per cent was natural ice and 90 per cent artificial ice.

Artificial-ice production is at present carried on in small plants with limited output, the United States Census figures showing the average capital invested per plant to be only $50,000 with an annual output of the value of about $20,000.

These rough figures show that ice making satisfies a number of the conditions previously noted as being required of an allied industry that might be developed to absorb the extra output which the station could produce without additional investment, and it is at least worth the careful study of the managers operating stations located in the larger cities.

It appears, therefore, that the supply of current for electric lighting, for which central stations were first established, is destined to expand, that a still larger extension is probable in the direction of applications of industrial power, that electric heating is of relatively small immediate importance and is not likely to make large demands upon the station in the near future, that new and still undeveloped applications are likely to cause large demands for current and that central stations operating independently or in some kind of productive combination with allied service have in store for them a future development as important as that of any other line of industrial enterprise.

Russian Consular Reports.

It is given out semiofficially, says Consul-General John H. Snodgrass, of Moscow, Russia, that the Ministry of Commerce and Industry has organized a Bureau of Information and Reference for the dissemination on a large scale of information concerning foreign commerce, with the view of enlarging Russian trade throughout the world.

The Bureau will publish special bulletins, to be sent out to all trading and commercial organizations, boards of trade, and to all firms interested in Russia's foreign and domestic commerce, the main material for these publications being obtained from the reports of consular officers. All consular correspondence relating to commercial matters will be concentrated in the Ministry of Commerce and Industry, from whom the consular officers will receive immediate directions and instructions as to their guidance on all leading questions. Besides this, the Bureau will receive contributions from the agents of the Ministry of Finance, who will soon be transferred to the Ministry of Commerce and Labor.

As far as it is in its power to do so, the Bureau will take up subjects and questions pertaining to domestic and foreign trade and commerce, particularly those matters tending to increase the export of Russian produce and manufactures in a given foreign country, based upon systematized and classified data contained in the various contributions, whether they be from the consular representatives or from unofficial sources.

Electrical Notes From Great Britain.

By Our British Correspondent.

September was the month of several interesting conferences. Beside the annual gathering of the British Association for the Advancement of Science, which was held in Sheffield, there have been two tramway conventions in which English tramway officials have been interested, and the meeting of the Iron and Steel Institution at Buxton.

Two papers of electrical value were brought before the Iron and Steel Institute during its meeting (September 26 to 30). One of these was read by J. J. Elink Schuurman, of Baden, Switzerland, on "The Utilization of Electric Power in the Iron and Steel Industry: with Special Reference to the Economical Speed Regulation of the Motors." An abstract of this paper will be given in a later issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

The other paper was on "Electric Steel Refining," by D. F. Campbell, London. For more than sixteen months single furnaces have been producing over 200 tons per day, and the author said it was obvious that the field for the process had widened, and many electric furnaces were in construction or in operation in England. He regards the electric furnace as being especially suitable, and sure of wide adoption, for any class of work in which raw materials of a high degree of purity are now used. To his mind there is little doubt that crucible steel, Swedish billets, and products of intermediate quality, such as are used for the Sheffield trade and by tube makers of Staffordshire and South Wales, can be economically replaced by steel refined by electricity, and made in Middlesbrough, Cumberland, or the larger steel works in the Sheffield and Rotherham districts. The use of the electric furnace was not likely to become general for steel-rail manufacture at the present time, except in cases where the conditions are exceptional, such as, for instance, South Chicago, where the economic conditions, notably the scarcity of good Bessemer ores and the demand for better rails, have influenced matters. Wm. Campbell later stated that in the electric furnace almost any degree of refining could be economically effected, and the removal of sulphur, phosphorus, and oxygen was especially easy.

The rarity of blow holes in electric steel when properly made was mentioned. As to the cause of these troubles, it was well known that any ingot of steel when placed in a vacuum evolves nitrogen, and this is about equally true whether it be made in the crucible, the Bessemer converter, or the electric furnace. Blow holes contain nitrogen, but this is probably not the cause. It is far more probable that they are due to the combination of oxides with the carbon in the process of cooling, and that the carbon monoxide so formed at a high temperature causes blow holes in the cooling steel, and owing to the diminution of volume of the carbon monoxide on cooling, a partial vacuum is formed, and nitrogen is sucked into the blow holes. In electric steel, oxides do not occur in any quantity and consequently the prime cause of blow holes is reduced. Further, the quality of electrically refined steel is better than a material of similar chemical composition made in any oxidizing furnace. This is probably due to the reducing conditions under which it is finished.

The various conditions affecting the question of cost of applying the process were stated, some figures given being based chiefly on Héroult furnaces in America, England, Germany and France, as this type had been widely adopted and single furnaces were now refining as many as 250 tons per day. Mr. Campbell went on to allude to the readjustment in the steel trade that would follow the adoption of electric refining in England. As soon as the Sheffield steel smelter has become acquainted with the process, and accustomed to the working of electric furnaces, electrically refined steel will largely replace ordinary crucible steel, as has already happened in Germany and America. Large crucible plants and small open-hearth furnaces engaged in the manufacture of small and intricate castings, such as motor-car parts, etc., may be replaced by electric furnaces, because the high degree of fluidity and dead melt obtained is especially advantageous. "In many cases manufacturers of axles, guns, and tubes will abandon the use of Swedish raw materials, and refine steel made from low-grade ores, thus reducing the value of high-grade ore deposits and the quantity imported; for, by the use of electricity, Cleveland stone will produce a steel equal to the best hematite ores. The capacity of many Talbot and basic open-hearth plants will be increased and the quality of the product improved, while much of the power that is now going to waste will be utilized for steel refining."

The tramway conventions to which references is made above are, the annual convention of the Municipal Tramways Association, which is in progress at Bradford while these notes are being written, and the Congress of the International Tramways Union, which was held at Brussels from September 6 to 11. At Bradford, after the address of the president, C. J. Spencer, the manager of the Corporation electric trolley system there, the subjects receiving attention are: "The First Decade of Municipal Tramway Working," by Alderman S. Flint; "Brake Shoes," by J. W. Dawson; "Tramways and Their Relation to Town Planning," by A. Baker, manager of the Birmingham municipal system; and the "Lubrication of Car Bearings," a joint paper by four different tramway managers.

Some interesting points are touched upon in the annual report of J. A. Bell, the city electrical engineer of Aberdeen. The year's results still show the effect of the metallic-filament lamp on output, but, as he says, there are compensations, for he is now obtaining a class of consumer (such as the smallest cottages) that was not to be won by carbon-filament lamps. There is a good advance taking place in current consumption for heating, and owing to the hiring-out department having broken new ground of this kind, the heating output has been doubled. The charge for electricity for such purposes is now to be reduced from three to two cents per kilowatt-hour in the belief that a further gratifying development will follow. Experience in many places is proving that the charge for heating current must not exceed two cents per kilowatt-hour if it is desired to encourage a good load of this description. Mr. Bell expresses his opinion regarding the predilection of some architects

for gas, saying: "The Aberdeen architects are, to a large extent, still installing gas for lighting purposes in small houses within the city, and I am inclined to think they neglect the fact that a thoroughly sound and satisfactory installation of electricity is as cheap to install, and nowadays practically as cheap, light for light, as gas, irrespective of the many incidental advantages which electricity can claim." Aberdeen is now considering whether to experiment with a system of giving bonuses to employees in its electricity works; several municipal lighting plants are run on these lines in the United Kingdom, and the results are said to be very satisfactory in the effecting of economies.

Electricity-supply developments at Dublin have made it necessary to arrange for increasing the capacity of nine of the old substations. The Halifax municipal station is taxed to the limit of its capacity, owing to big demands from power consumers, and $50,000 of new plant is to be added. The Glasgow Electricity Department Committee in its report just issued says that it is considering a scheme whereby domestic consumers may have a supply of energy from the lighting circuits for cooking, heating and other domestic uses at a lower rate than the charge for lighting, the cost of separate wiring being avoided. The lighting consumption is over 15,000,000 kilowatt-hours (sixteen to two cents) and that for power and heating nearly 20,000,000 (three cents to one cent). The total number of private consumers is 19,154, and, of these, some 6,417 consuming 1,685,759 kilowatt-hours are domestic consumers and churches, and only 340, taking 216,237 kilowatt-hours, are heating consumers. Nearly 20,000,000 kilowatt-hours were supplied for power during the year. Private consumers took on the average about 20.63 kilowatt-hours per lamp fixed, as compared with 21.17 a year ago. The number of consumers has increased by 7.33 per cent, but the maximum load or demand on the generating stations is only 0.6 per cent greater, being 21,719 kilowatts as compared to 21,585. Accrington electricity department is planning to spend $82,000 upon plant and mains extensions; Barrow-in-Furness will spend $25,000 for similar purposes, Bootle $42,000 for mains, etc., Stockport $35,000 for mains, West Bromwich $57,000 for extensions to its direct-current plant, Wolverhampton $34,000 for power plant and refuse-destructor extensions. The question of charges to consumers is receiving attention in many places, and revisions are being made in some. Wakefield is increasing the price per kilowatt-hour to nine cents, and is putting on a meter charge in certain cases. Its controllers hold that these alterations are reasonable, bearing in mind the great saving which lighting consumers are receiving from the metal-filament lamp.

In the annual report of the British-Thomson-Houston Company, Limited, which is just out, it is stated that this company has exchanged a license for its "Mazda" lamps with the General Electric Company, Limited, for a similar license relating to "Osram" metal-filament lamps. ALBERT H. BRIDGE.

London, September 21, 1910.

Gas-Producer Engines at Brussels.

In view of the successful experiments of the Geological Survey in developing the gas-producer engine, and its consequent wider utilization in the United States, the extensive English displays of such power plants at the Brussels Exposition are of interest.

One company exhibits an open-hearth plant of 200 horsepower and supplies the three gas engines on the company's stand some eighty yards away. One of its most important features is that ashes and clinker can be easily removed while it is at work, thus enabling it to be run continuously without the need for a duplicate producer and permitting inferior fuel to be utilized; and another is that the evaporator is placed in the zone of most intense combustion, with the result that the durability of the lining is enhanced and the adhesion of clinker to the sides is prevented. Another concern shows a patent bituminous suction gas plant, of eighty horsepower, specially adapted for consuming common Belgian coal and fitted with a tar extractor; while another suction plant has a new type of ash box with water-sealed bottom, which permits the ashes, etc., to be easily removed while the producer is at work.

A fourth exhibit is a suction producer designed to use Welsh or Scotch anthracite and gas coke or charcoal, and with a guaranteed fuel consumption of one pound per horsepower per hour on a continuous test with anthracite, or one and one-quarter pounds per horsepower per hour with good gas coke or charcoal. A fifth exhibit consists of a suction-pressure gas-producer plant and model of a Mond gas plant with sulphate of ammonia recovery apparatus.—*Daily Consular and Trade Reports.*

Railways Exhibition in Russia.

The Russian Technical Society of St. Petersburg has decided to postpone its exhibition to demonstrate the application of electricity to railways from August 28 to November 28, 1910, until April 28, 1911. It will thus be synchronized with the celebration of the seventy-fifth anniversary of the existence of railways in Russia, which will also be celebrated by the Technical Society at that time, the doors to be open until June 28, 1911.

The exhibition will be divided into three sections, viz: (1) The application of electricity to the working of steam railways; (2) the application of electrical energy to train traction on (*a*) main railway lines, (*b*) local railways, (*c*) tramways; (3) the application of natural water power.

A commission of experts will make reports to the Russian Government in regard to such exhibits as are most prominent from the view of public utility, and also those that most fully correspond with the aims of the exhibition. The Minister of Commerce must confirm all rewards. It is regarded as important that anything new in connection with electrical traction, especially electromotors, monorail lines, and the like, should be placed on exhibition.

In connection with the exhibition, a special trial ground will be arranged, at which all the exhibits of electric railway motors will be tested on the level and with varying grades and loads. Exhibitors will be permitted to dispose of their exhibits during the progress or at the conclusion of the exhibition, with the exception that any engine sold must be replaced. Application for space will be received until February 28, and exhibits will be received between March 28 and April 23, 1911. Applications should be made to the president of the organizing committee of the exposition, N. A. Sitenko, 24 Sadovaia, St. Petersburg.

This is a favorable opportunity for American manufacturers and inventors to take part in an exhibition that will be patronized by the Russian Government, which has invited the world to assist in electrifying its railroads.

CENTRAL-STATION PRACTICE

Transmission—Interior Wiring

ELEMENTS OF POWER-STATION DESIGN.—VI.

STEAM PIPING AND AUXILIARIES.—I.

BY W. B. GUMP.

Before a steam plant is installed the scheme of piping must be worked out, and accurate drawings of all the details made, in order to facilitate the construction of the plant, and bring about harmony throughout the system. The particular arrangement of piping to be adopted must necessarily be governed by the operating requirements; hence fixed rules cannot be given. There are certain principles, however, which should be carefully observed when laying out a piping system. The present discussion will be confined mainly to high-pressure systems.

Material.—The best modern practice in high-pressure steam demands extra heavy mild-steel pipe, lap or butt-welded with flanged joints. Wrought-iron pipe is ordinarily called for, and this is virtually the same as mild steel, unless the term is more closely adhered to than usual. Wrought iron is capable of greater resistance to corrosion, and should be used in places which are subjected to moisture, or where the pipe must be buried in the earth. It is seldom that wrought-iron pipe is warranted since mild-steel pipe can generally be covered, or otherwise protected, from moisture and corrosion. Manufacturers are therefore apt to supply mild-steel pipe unless wrought iron is definitely specified, as the former will almost invariably fill the requirements in a satisfactory manner.

Cast-iron pipe is not used to any extent except for special purposes, such as specially constructed branch pipes and manifolds. The chief objections to cast iron are its great weight and its nonuniform structure, or lack of homogeneity.

Cast-steel headers have been employed for highly superheated steam, on account of not being affected by high temperature, as is the case with cast iron. Due to high first cost the use of cast steel has not been general.

Copper pipe has been used in marine service chiefly because of its flexibility. Its great cost has limited its use, and at the present time it is being largely superseded by steel and wrought iron. Aside from the cost, copper pipe has

FIG. 1.—SCREWED-FLANGE JOINT.

marked advantages, but since the cost will continue to be high its field for this work will accordingly be small.

Elbows, tees, and flanges are made of cast iron, pressed steel, malleable iron, and other compounds of steel such as "ferrosteel." For ordinary pressures (up to 125 pounds per square inch) standard cast-iron fittings may be

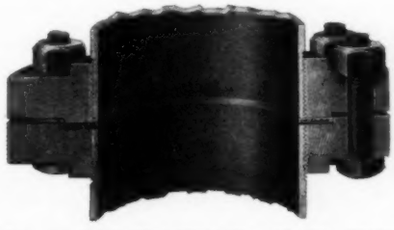


FIG. 2.—SCREWED-FLANGE JOINT WITH COUNTERSUNK FIT.

adopted. For high pressures it becomes necessary to use extra heavy castings or special metallic fittings having a high bursting strength.

Commercial Pipe.—The pipe usually kept in stock, and purchased for steam power plants may be classified as: (*a*) Standard or merchant; (*b*) full-weight; (*c*) extra-heavy; (*d*) double-extra-heavy.

Pipes above twelve inches in diameter are reckoned on a basis of the outside diameter, and are designated as O. D. Pipes under this size are based upon the Briggs standard. The O. D. pipe is made in different weights according to a specified thickness of metal used. Extra-heavy and double-extra-heavy pipe are of the same external diameter as the standard but of greater thickness; hence the inside diameter is less.

For pressures up to 125 pounds per square inch the standard or full-weight pipe is entirely satisfactory. Above 150 pounds the extra-heavy pipe should be installed. As far as safety is concerned standard pipe will remain intact under a pressure several times greater than the working pressure. The use of extra-heavy pipe is to be recommended principally because the fittings are stronger and the entire piping system is more rigid. The factor of safety of standard pipe ranges from six to fifteen, the average being between eight and ten. Hydrostatic tests are not generally less than 500 pounds per square inch in any case, and from this figure up to 1,500 pounds. It must be remembered that continual vibration may start the joints, and thus cause leaks or create other damage. Solidity is, therefore, desirable, particularly with high pressures.

Pipe Joints.—The methods of joining steam pipe are almost endless, and only a few of the most important will be described. Probably the most common is that illustrated in Fig. 1, which shows the screwed-flange type. The chief advantages of this joint are that it is convenient to fit, and is rigid when complete. It is necessary to have the bolts drawn tightly, on account of holding the gasket to a steam-tight fit, as a slight separation of the flanges will cause leaking.

The joint shown in Fig. 2 is a modification of Fig. 1, and has the advantage of a countersunk fit, which holds the gasket in a fixed position, and is com-

paratively tight under less bolt tension than in the former case. A disadvantage lies in the fact that the flanges are subjected to a considerable strain when the bolts are drawn very tightly, and under conditions conducive to vibration this strain is aggravated. However, this joint gives excellent satisfaction when assembled properly.

The joint in Fig. 3 is known as a shrunk fit. Here the flanges have long hubs which offer a large area of contact with the pipe. The end is beaded over,

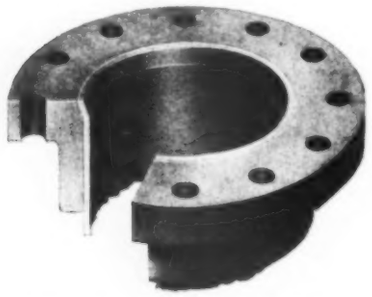


FIG. 3.—SHRUNK-FIT JOINT.

after the pipe is shrunk, thus reinforcing the joint, and rendering it thoroughly steam-tight.

The joint illustrated in Fig. 4 is among the best obtainable, and is known as a lap joint. In this construction the flanges are free to shift on the pipe, the gasket being placed between the flared ends, which are first made true by facing with a light cut. For very high pressures this joint is excellent.

FIG. 5.—WELDED JOINT.

The most solid construction is that shown in Fig. 5 which is a welded joint. In this joint the pipe and flange are made one piece. The cost of this joint is high, and consequently its use has been limited. It is found to be very satisfactory for high-pressure piping, especially where high temperature is used.

Gaskets for these joints are preferably of copper, since this can be squeezed, and made to conform to the faces of the flanges.

Valves and Fittings.—The most vital feature of a piping system is the arrangement of valves. Until recently too little study has been given to this part of the plant, and numerous examples are to be seen where plants are operating under difficulties because the original design was neglected.

Steam valves are of so many varieties that they cannot be treated here in detail. Both globe and gate valves are used extensively, the latter being adapted more especially to high-pressure pipe lines, and piping systems which convey steam at a high velocity. Globe valves should always be placed so that the pressure is exerted against the stem when the valve is closed. Otherwise

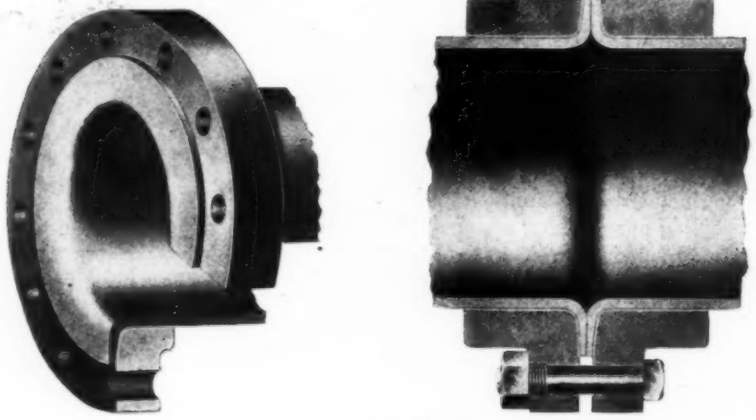


FIG. 4.—LAP JOINT.

the loosening of the stem would prevent opening the valve.

Valves above six inches in diameter should generally be provided with a by-pass for two reasons,—(1) to remove pressure from the steam side when opening the valve; (2) to warm up the piping, and thus lessen condensation when the main valve is opened.

It should be noted that globe valves should not be fitted with the stems in an upright position in horizontal lines, on account of forming steam pockets and thereby accumulating condensation. Screwed valves above six inches in diameter are not generally recommended. Above this diameter they should be flanged when used in high-pressure lines.

As to operation, valves may be classified as inside-screw and outside-screw. They are also classified under rising and nonrising stem. The advantage of the outside screw or rising-stem valve is that the degree of opening is clearly observed by the height of the screw. With the type of inside screw in which the stem does not rise, some form of indicator is required to ascertain the amount of opening. The advantage of the inside-screw type is that the threads are not exposed to dust or grit; hence this valve will wear better in places which are subject to the elements mentioned.

There are two general types of gate valve, the solid wedge, and the split wedge. The latter is more flexible in its operation and less likely to leak than the solid wedge. With respect to a choice of the valves to be used, no rules can be given. The question of cost will in most instances not only determine the choice but also the number of valves in the system. Too frequently the cost has stood in the way of a good system, and has hampered the operation through a lack of flexibility, when a greater expenditure would improve the commercial economy, and offset the first cost of the piping.

Automatic and Emergency Valves.—Where it is desired to invest a certain portion of the cost of piping in safety devices, automatic nonreturn valves are to be commended. The purpose of such valves is twofold; to equalize the steam pressure, and to close in case of a reduction in pressure in a boiler unit, preventing an inflow of steam to the boiler from the main line. It is important that these valves be constructed so as to be free to operate under a small difference in pressure, in order not to stick and thus defeat the object sought. This form of valve is a safety

stop to prevent steam being turned into a cold boiler in which men are working, and in this respect has a distinct advantage.

Emergency valves are a necessary adjunct in large power stations if safety to human beings and to apparatus is to be assured. About the simplest form of emergency valve is a weighted valve of the butterfly type. Such valves may be placed at points where it is deemed advisable to cut out a portion of the system either voluntarily or by automatic means. In applying this valve to steam engines, a simple and positive arrangement is made by using a cord or mechanical connection from the valve to the engine governor. In the event of excessive speed, the engine governor trips a lever which actuates the cord, closing the valve instantly, and shutting down the engine.

For high pressures a butterfly valve is not as satisfactory as a plug valve or cock, which is evidently balanced for all positions, and is steam-tight. In large sizes, however, a plug valve is apt to stick and prevent its proper working.

Globe or angle valves may be electrically or mechanically operated, and serve for emergency purposes in a highly satisfactory manner.

Back-Pressure and Atmospheric Relief Valves.—Back-pressure valves are used to limit the steam pressure in exhaust piping. In condensing plants such vlaves are classed as "atmospheric relief" and are designed to remain closed for all pressures below the atmosphere. In connection with condensers such valves should be water-sealed, to prevent the possibility of air leaks. Back-pressure valves are of two general types; those opening against a weighted lever, and those operating against the action of a spring. One of the disadvantages of a spring is that it it apt to corrode or become loose, and thus alter the tension or compression necessary for a certain steam pressure. In the lever type the adjustment is generally more certain. The first cost as well as local requirements will decide which type is best to use.

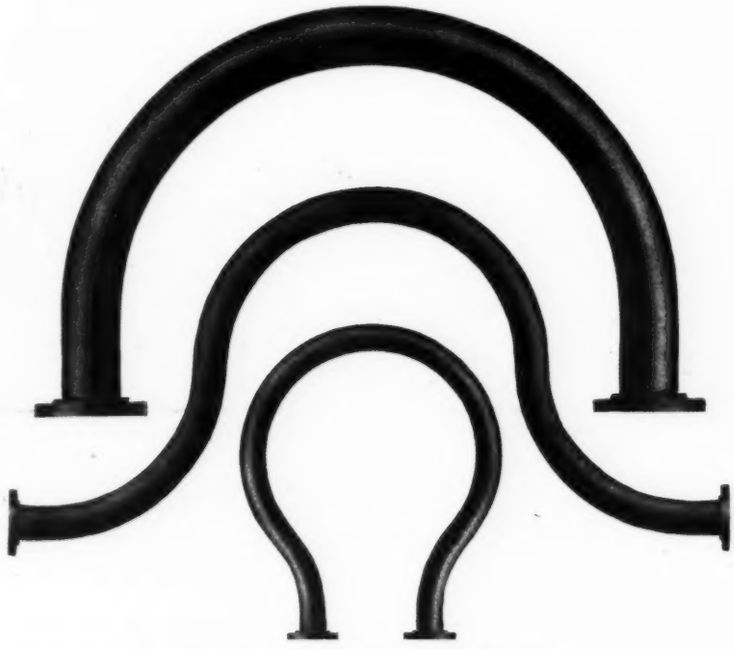


FIG. 6.—VARIOUS FORMS OF PIPE BENDS.

Pipe Covering.—In order to reduce radiation losses in pipe it is necessary to cover it with a heat-insulating material. When covered with first-class material, the losses may be reduced as much as ninety per cent.

The radiation loss in piping depends upon: (*a*) Diameter of pipe; (*b*) whether vertical or horizontal; (*c*) nature of surface; (*d*) condition of surrounding air.

There are a number of good commercial coverings which are satisfactory, and may be relied upon if purchased from a reputable manufacturer. The principal substances employed in covering are magnesia, asbestos, hair felt, and mineral wool. A covering of carbonate of magnesia is widely used and is about as efficient as any when applied in the proper manner. There are many other materials, each having a different name, the manufacturers of each claiming certain superior qualities over other coverings. There is but little difference, however, between the high-grade materials most commonly used in the larger plants. Pipe covering should not be applied until after the system has been under steam, because of the fact that leaks will interfere with the efficiency of the material, and are apt to cause deterioration and a consequent short life of the covering.

After the material has been carefully attached to the pipe a thickness of canvas should be bound over the outside as a finish. This may be given two or three coats of paint and thus be made to present a neat appearance.

Expansion.—The first feature to demand consideration in laying out a system of steam piping is provision for expansion. If this is not given due thought the results are almost certain to be disastrous after the plant is started. It is then too late to apply a remedy except at great cost and annoyance.

To give a clear conception of the strain to which a steam pipe may be subjected, consider a six-inch standard extra-heavy wrought-iron pipe, 150 feet long, under conditions as follows:

Steam pressure = 175 pounds.

e = modulus of elasticity = 30,000,000.

t_f = final temperature.

t = initial temperature.

c = coefficient of expansion.

A = area of pipe = 8.5 square inches.

S = force in pounds.

The formula for determining this stress is:

$$S = e\,A\,c\,(t_f - t)$$
$$= 30{,}000{,}000 \times 8.5 \times 0.0000075 \times (371 - 60)$$
$$= 59{,}500 \text{ pounds.}$$

Here it is assumed that the temperature of the pipe when cold is sixty degrees Fahrenheit. This enormous pressure is clearly a factor demanding careful consideration if serious trouble is to be avoided.

The increase in length of the pipe would be:

$$I = c\,(t_f - t)\,L$$
$$= 0.0000075 \times 311 \times 150 \times 12$$
$$= 4.2 \text{ inches.}$$

The method of construction best adapted to resisting expansion strains consists in placing bends at all portions which are exposed to stresses from this cause. There are many styles of bends used. Those most commonly employed are known as long-radius bends. Several styles of these bends are shown in Fig. 6. The expansion strains may be taken up within the elasticity of the bends, which are rigidly bolted into place. Expansion joints are used in some large systems, but these should be avoided when possible, as they are more or less complicated, and are generally rather difficult to keep steam-tight. One of the simplest means of taking up expansion without causing serious strains or distortions in small pipe is that shown in Fig. 7, and known as double-swing joint. The two diagrams given will show the manner in which expansion is provided for. It should be noted that such an arrangement is not practical for large pipes, since it is necessary to flange the joints. With this scheme of joint the friction is considerable and must not be disregarded. In a feed-water line this arrangement is not necessarily objectionable, although it is apt to cause vibrations and loosen the fittings when not connected up carefully.

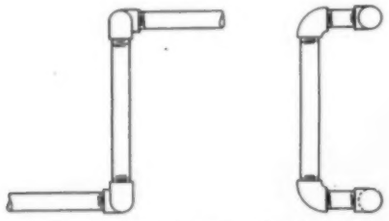


FIG. 7.—DOUBLE-SWING JOINT.

(To be continued.)

Pointers on Firing.

"I am continually having trouble in my boiler room," said a New York central-station manager the other day. "My men, although fairly well posted in many ways, are deficient in knowledge of coal economy. When I began my career I was put to work at the furnace of a big boiler. I make it a point to study drafts, and thickness of coal on grates.

"The thickness of fire to be carried should depend altogether on the draft. If it is strong, the fire should be heavier than when it is weak, and a soft-coal fire should be thicker than one of anthracite. For hard coal four to six inches should be the depth, and for soft coal six to eight inches. The fuel should be spread evenly over the grate and not allowed to burn in holes, leaving the bars bare, as the cold air will rush in and chill the heating surface.

"When cleaning the grate, push the upper part of the fire back, leaving the clinkers, ashes, etc., on the grate, then draw the ashes out. To clean the back end of the grate, pull the good fire forward again, and draw the clinkers and ashes of the back end *over* the fire, mind you, and into the ash-pan. When you've cleaned it, you must spread the fire evenly all over the grate, and then cover it over with fresh coal, but not too heavily. I always took great care with anthracite coal, not to let the fire burn too low before cleaning it, or else you will not have fire enough left to cover the grate, and it will die out.

"But bear in mind, whatever is done must be done quickly. Keep the furnace door open no longer than is necessary. Do not clean more than one fire at a time.

"I have found that a soft-coal fire needs breaking up at short intervals, as it has a tendency to crust over on top and thereby reduce its heating value."

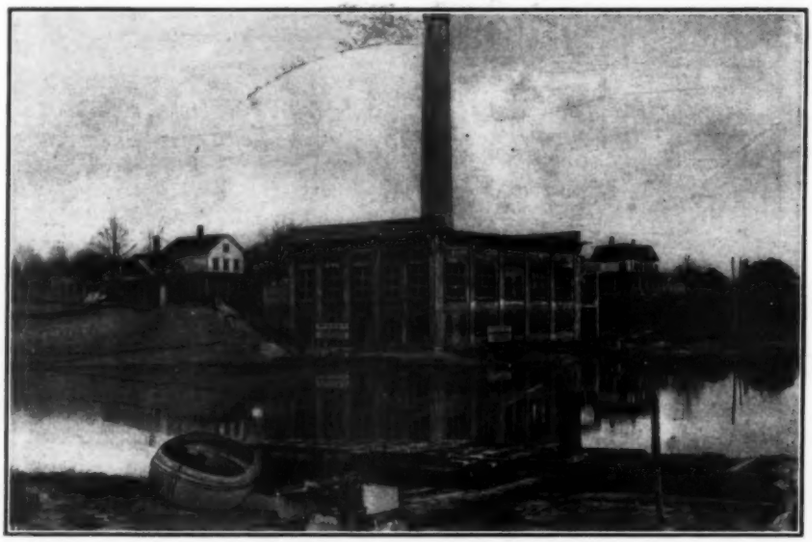
Electric Power in Excavation Work.

The Denver Gas & Electric Company has contracted with the concern doing the excavation work on the new Denver postoffice for twenty horsepower of current for electrically operated machines.

Power Plant at Old Saybrook, Conn.

The power plant of the Shore Line Electric Railroad Company, located at Old Saybrook, Conn., while not a large generating station, is of interest as being one of the best equipped and most modern plants which has been recently constructed. On September 17 the line was open to the public, and at present cars are in operation between Ivorytown and Guilford, and the track is being extended to Stony Creek.

The boiler-room equipment of the generating station consists of three Bigelow & Hornsby water-tube boilers each having a capacity of 625 horsepower. Each boiler is equipped with a Taylor underfeed gravity stoker and Wheeler surface condensers are used. As the plant is situated on the banks of the Connecticut River there is an adequate supply of water for boiler feed and other purposes.



POWER PLANT AT OLD SAYBROOK, CONN.

Power is generated by two 1,500-kilowatt Curtis turbines, three-phase, 11,000 volts. For furnishing excitation current to the generator a thirty-five-kilowatt, direct-current turbine is employed. There is, in addition, a motor-generator set.

The substation at Saybrook Junction contains a set of 11,000-volt, 160-kilowatt transformers and three 200-kilowatt, 600-volt rotary converters.

All construction work on the the plant was done by the Aetna Construction Company, of New Haven, Conn., and the electrical apparatus was furnished by the General Electric Company, of Schenectady, N. Y.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

THE DEVELOPMENT OF VACUUM-TUBE LIGHTING.[1]

BY D. MC FARLAN MOORE.

The vacuum tube today assumes what is undoubtedly a most important position in the field of illumination. Because of the special qualities of its light, such as its softness, its even diffusion and its close approximation to daylight, and because of its economy, it makes a demand which cannot be denied upon the consideration of electrical engineers and all persons interested in effective lighting in any line. It attracts our interested attention, especially because it marks a great departure from our accustomed methods of lighting by electricity, in substituting long glass tubes of seemingly low brilliance for the "high spot" radiation characteristic of lighting by bulbs, and because it gives us light in an unusual range of colors.

The light from vacuum tubes and the light we ordinarily see are produced in entirely different ways. The electric bulb and arc lights are simply refinements of the torch of the primeval savage or the common candle. Their illuminating power results from the heating of minute particles until these particles begin to glow. If it is extremely high, the glow becomes white or bluish white. Such forms of light are therefore dependent for their effectiveness upon the amount of heat that can be supplied. Their scale of color and brightness is limited. Moreover, they are far from economical and transform into light, even in their most improved form today, only a very small percentage of the energy contained in the coal that is put under the boiler. They may therefore justly be described as primitive and inefficient even in their present highly developed form.

It is possible, however, to obtain light by the application of a more advanced principle known as selective luminescence. As all know, light is but one form of energy, one division of vibratory motion. In order of their increase in activity the divisions of motion might be listed as follows: mechanical sound, electricity, heat, light, actinism or chemism. Carbon or other particles, as in a candle flame or in the metals that come within ordinary experience, can by the application of heat or electrical or chemical force be driven into a certain limited range of activity, limited in the case of the carbon particles by their weight and in the metals by their more or less solid condition. But it is easily understood that some metals might be found in which the rate of vibration set up among the particles might be higher than is the case with carbon, or that activity by chemical or electrical means might be set up among the widely distributed particles of certain gases. It has in fact been found possible to set up by heat extremely high vibrations in a combination of the metals thorium and cerium. The Welsbach gas mantle is the practical application of this discovery in the field of what is known as selective luminescence. One of the best examples of selective luminescence produced chemically is the firefly. It is upon the possibility of electrically setting up vibrations in gases that the vacuum-tube light is based and the Moore tube light of today in its various forms is the practical application of this theory.

Vacuum-tube lighting began with the beginning of man-made electricity, but because of the many difficulties to be overcome, it has been slow in arriving at the practical stage. The first man maker of electricity was Hawksby. In 1750 he devised the first electrical machine, a primitive affair with a globe, no doubt somewhat similar to the electrical machine used by Benjamin Franklin. Hawksby created a partial vacuum in the globe of his machine, and noticed that a slight glow appeared when the globe was electrically excited. This interesting phenomenon was observed and then interest in it slumbered for over a hundred years.

In 1850 Geissler, with the powerful source of voltaic electricity that the induction coil had by that time put into his hands, developed what is known as the Geissler tube, an interesting laboratory toy consisting essentially of twisted narrow glass tubing, vacuumized, with electrodes at each end, which glowed when electricity at a high voltage was passed through it. In 1879 Crookes by enlarging the device somewhat and creating a higher vacuum, produced a more elaborate toy capable of showing various colored glows with various gases. This tube contained a suggestion of the possibility of commercial lighting through some such method. The Crookes tube also marked a considerable advance in the knowledge of the action of electricity and gases in partial vacuum, and through it came the theory of the bombardment of ions as a source of heat vibration and light.

The further development of vacuum-tube lighting is in greater part the history of the invention and perfecting of what is now known as the Moore tube light, that is, of our fight to make a practical and commercial application of the faint glimmer shown by the Crookes tube.

In 1891 I noticed a paragraph in a scientific paper stating that only three-tenths of one per cent of the energy of a coal fire could be converted into light under conditions existing at that time. This state of affairs struck me as almost tragically wasteful, yet authorities at that time were quite convinced that the limit of lighting efficiency had been reached. They were, of course, considering the question along the traditional lines. They were thinking that light could be produced only by the primitive method of applying heat. I was convinced that an entire change of base was necessary and immediately took up the idea of creating light in long tubes through gases where the atoms have full range for their activity.

My first step put the cart before the horse. I wrote a theoretical article for

1 Abstract from an address before the Franklin Institute, Philadelphia, September 21, 1910.

a magazine in which I attempted to show how effective lighting could be accomplished if we could do it by long tubes instead of by widely separted points. A great many of the methods then worked out, such as putting tubes along the groins of the arches and in the cornices, have been actually used by us many times since.

The first definite experiments were made with powerful induction coils and batteries. A device is only so strong as its weakest link. At the outset my weakest link was the break of the current of the vibrator of the induction coil, but experiments proved that the troublesome length of the break in the air which reduced the coil's efficiency could be considerably reduced when the break was made in a vacuum. So, by inclosing the vibrator and contact

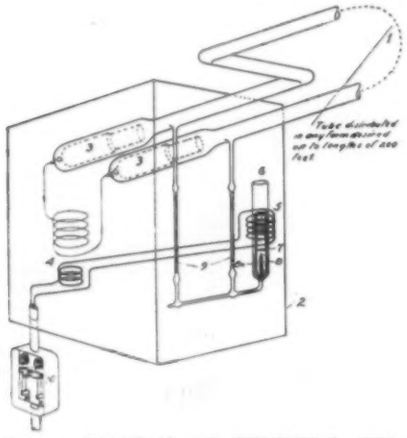


FIG. 1.—DIAGRAM OF ESSENTIAL FEATURES OF MOORE TUBE LIGHT.
1. Moore tube.
2. Terminal box.
3. Terminal electrodes.
4. Transformer.
5. Feed-valve coil.
6. Glass tube of feed valve.
7. Glass and iron wire displacer.
8. Porous plug.
9. Sand resistance tubes.
10. 220-volt, 60-cycle supply.

point in a bulb and excluding the air, I was able to help matters a great deal. In order to get the greatest possible light effect I devised bulbs, similar to the ordinary electric bulb, but containing many loops or points on the electrodes. I found quickly that there was great trouble in holding the vacuum because of the metallic electrodes in the tubes and bulbs and I tried many methods of circumventing this difficulty. The most successful seemed to be coating the ends of the tubes inside with a graphitic compound, making a sort of cap. It was with my apparatus in this shape and using rarefied CO_2 gas in the tubes that I was able, when I delivered a lecture, April 22, 1896, before the American Institute of Electrical Engineers, to illuminate the first room ever lighted by artificial daylight produced by a vacuum tube.

But the tube light was yet by no means practical. The life of the vibrator was comparatively short and some other method of making the break was called for. This I found could be accomplished by a rotating armature. While this improved matters and enabled me a month later to light an entire chapel at an electrical show held at the Grand Central Palace, New York, it was by no means a satisfactory expedient. The radiation of the tube was very low, about one-fourth candlepower per foot, and I recognized that radically new methods were called for. I then turned to the dynamo as a means of producing the needed current. Development along these lines came only as the result of endless and heartbreaking experimentation. At length, however, I obtained a very faint glow with this source of energy and was soon producing two candlepower to the foot of tube. But to do this I required a motor-generator as an auxiliary to give me the high voltage necessary. I needed also graphite-covered ends to my tubes almost as long as the radiating sections themselves. Both conditions I recognized as far from practical and my next step was to shorten the electrodes and put them in a box and thus make myself free to raise the voltage as far as I wished. At this time I began to make commercial installations, one of these being over the show windows of Marceau, the photographer, on Fifth Avenue, New York, where since 1903 the long tubes with their clear soft light have steadily remained in use every night, the source of interest and astonishment to the passing crowd. Other installations in various kinds of stores and windows were made about this time and all these, though, so to speak, modernized occasionally, have run constantly and satisfactorily from that time. Some were in stores, over ribbon and dressgoods counters where the fact that the light from the CO_2 gas reproduced daylight absolutely made them of inestimable assistance to customers selecting and matching colors.

But now the tube itself proved the weak link in the chain, for in a comparatively short time the supply of gas in it was used up. I experimented with methods of automatically creating the gas, as through chemicals responding to heat, catalytic action, etc., but none were as effective as I wished. It was necessary to devise a means of feeding the tube with gas as required and I eventually developed an automatic throttle, which in its present perfect stage solves all difficulties and gives a tube light that is practical and efficient from every point of view. It is in a measure the heart, or perhaps, since it is the means by which the light breathes, it will be best called the lungs

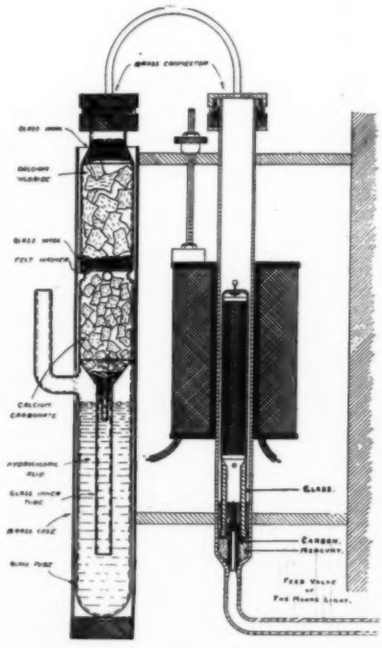


FIG. 2.—DETAILS OF FEED VALVE OR THROTTLE.

of the machine. Its special recommendations are its extreme simplicity, its lack of any friction or tendency to wear, its consequent durability and its absolute automatic functioning.

Now to explain its action briefly; I had found it possible to substitute for the cumbersome motor-generator a modern type of transformer to step the current up to the high voltage necessary. Fig. 1 shows that current entering the transformer returns through what is practically a solenoid. Referring to Fig. 2, which shows the throttle more in detail, one can see that this solenoid has through its center one glass tube and inside that another. This latter has in its top section a bundle of iron wires that act as a core to the solenoid. The lower end of this tube encircles a carbon plug with a sharp tip that stands in a deep pool of mercury. The operation of the throttle is strikingly direct.

As the resistance in the tube becomes less, owing to the using up of the gas, the quantity of current flowing through the transformer increases. As it increases the magnetism of the solenoid increases and it lifts its core, thus lifting the end of a small glass tube out of the mercury and lowering the mercury's level. When the lift of this small tube within the valve is great enough, the tip of the carbon appears above the lowering level of the mercury. The carbon is sufficiently porous to permit the passage of gas, but it is normally sealed by the surrounding mercury. When the little tip protrudes, however, enough gas is drawn through it to replenish the radiating section. Then the resistance there becomes higher, the amount of current passing through the solenoid becomes less, and the small tube drops again, forcing the mercury over the tip of the carbon plug.

The supply and creation of gas is also automatically regulated. Every time the light "breathes" it creates a slight vacuum in the throttle tube. A second cylinder forming a gas generator is joined by an air-tight connection with the throttle tube. In its bottom chamber this cylinder contains dilute hydrochloric acid, and it has two chambers above, one filled with calcium carbonate and one with calcium chloride, when CO_2 happens to be the gas employed. From these upper chambers into the dilute gas below extends a small glass pipe. When, by the exposing of the tip of carbon in the throttle valve, gas is drawn into the illuminating section and a vacuum formed above the throttle, some of the dilute acid is lifted by suction through this pipe into contact with the calcium carbonate. Thus CO_2 is formed to rush in and fill the slight vacuum, allowing the acid solution to drop out of contact with the calcium carbonate and stopping the production of gas until more is needed. This description applies to the most complicated form of controlling device where special gases are used. When only plain air is employed the generator section can be omitted and the air supplied from the open top of the tube running through the solenoid and encircling the core tube.

The difficulties presented in supplying exactly the proper amount of gas to the tube just when it needed it were immense. The operation dealt with factors of extreme delicacy. A variation of only one hundred thousandth of an atmosphere could be allowed in the vacuum of the tubes, a variation which, if measured by a barometric column of mercury, would be so small that the change in height could be distinguished only by a microscope. To approach the problem by any of the ordinary methods of mechanical or electrical control was manifestly impossible. It was only through appreciating and utilizing to the full the great change in resistance that follows a small change in the vacuum of the gas in the illuminating tube itself that the end could be accomplished. The regulation achieved by this device, however, is perfect. The tubes operate at between twenty-three and twenty-four amperes. When through the exhaustion of the gas the resistance in the tube decreases enough to let through twenty-four amperes, the throttle opens and enough gas is admitted to reduce the amperage to twenty-three. While this careful regulation of the vacuum is rquired in the tube it is extremely hardy to variations in voltage and will operate without any loss of effectiveness at ten volts below or ten volts above its normal, either 110 or 220 volts on sixty-cycle circuits.

In its present form the light furnishes soft but penetrating illumination in absolutely practical and economical form either in long tubes or in tubes arranged in compact or portable form as "windows," see Fig. 3. Various colors are possible. The most economically produced is a yellow, from nitrogen. Air alone gives a pleasing rosy glow. Perhaps, all things considered, the most valuable is that obtained by the use of CO_2, which gives a light that reproduces average daylight. This is of great commercial value in all trades that are in any way dependent upon color, such as dyeing establishments, printing shops, weaving and spinning mills, and especially in haberdashery and department stores, where it shows goods in their right colors and enables accurate matching to be done, regardless of daylight, during the entire twenty-four hours of the day if necessary. Color matching and selecting usually deals with the very finest and most refined shades and tints and hence the immense value of an artificial daylight can easily be understood.

The installations of the Moore tube

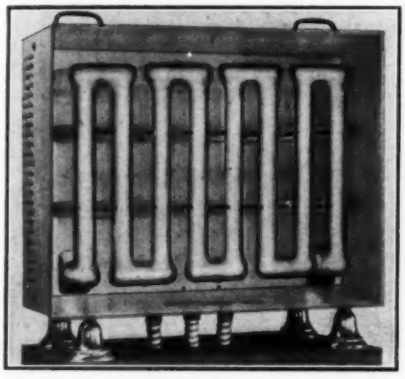


FIG. 3.—MOORE PORTABLE "DAYLIGHT" WINDOW—SIZE 21 BY 26 INCHES.

FIG. 4.—MOORE TUBE LIGHTING AT NEW YORK POST OFFICE.

light are in nightly and even daily use in a wide variety of trades. One of the most effective plants is the color testing and comparing rooms in the Weidmann Silk Dyeing Company, the largest concern of its kind in the country. Lithographers are using it, and by it are able to do accurate color printing at night. Jewelers are using it to help grade and match diamonds and other precious stones. The Standard Oil Company is using it so that the color of the oil flowing from its stills can be accurately judged. Photographers are using it and get the softest daylight effects in night work.

Florists are using it so that their flowers may be seen in the same colors they have under the blue sky. Art galleries are using it so that the pictures they have to sell shall be seen in all the vigor or delicacy the painter, who made them under daylight, meant that they should have. The air and nitrogen tubes are used in many stores and give the best distributed and most shadow-free illumination to be had and the illumination easiest on the eyes. The largest equipment of this kind, Fig. 4, is in the New York City Post Office where nearly a mile of tubing has been used for several years to light an entire floor.

The development of the Moore light in commercial form has meant the creation of many special devices. One of the greatest practical difficulties met with was in cutting and joining tubes of such great length. Special nippers with a loop of wire heated by electricity simplified the first process and Y-shaped blowpipes with two nozzles directing their flow inward overcame the other. Indeed in every department of the manufacture glass blowing of the most expert kind is needed. For creating the proper vacuums and maintaining them, new kinds of pumps had to be devised. In fact every new development in the light meant the creation of an entirely new tool.

By a careful process of improvement in details all delicate parts of the light have been eliminated. A very recent modification in the form of the throttle valve makes it possbile to box the window form of the Moore light and ship it anywhere by ordinary express. It can be claimed that the nitrogen tube light shows a very definite gain in efficiency over any form of electric light now in extistence.

Convention of Illuminating Engineering Society.

The fourth annual convention of the Illuminating Engineering Society will be held October 24 and 25, 1910 in Baltimore, Md. The convention will meet at the Johns Hopkins University.

Following the two-days' convention there will be given at the University a course of thirty-six lectures on illuminating engineering. These lectures will be given in the Johns Hopkins physical laboratory from October 26 to November 8. A large number of those who will attend the convention have already arranged to take advantage of the unusual opportunity offered by the lecture course. The lecturers have been invited by the University upon the advice of the Society and will be representative of the best and most advanced thought of the profession. A complete list of the lecturers was given in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for June 11.

Plans are rapidly maturing for the convention proper. A registration bureau will be opened at the University at 8:30 a. m. on Monday, October 24. There will be two sessions on each day of the convention, morning and afternoon. On Monday evening there will be a public lecture in McCoy Hall of the University to be followed at 9:30 p. m. by a reception in the physical laboratory and an exhibition of the apparatus to be used in the lecture course.

Plans have been made for an automobile tour for the ladies who attend the convention. The trip will embrace the city and its parks and will take place during the afternoon session of the first day. On Tuesday there will be a trolley trip for the ladies with luncheon at the Baltimore Country Club. On Tuesday night there will be a banquet which will conclude the convention.

Montreal Street-lighting Contract.

It has been decided by the Board of Control of Montreal, Canada, to recommend to the City Council the acceptance of the Montreal Light, Heat & Power Company's offer for street lighting. The contract is for a period of ten years. The Council will probably amend the recommendation to provide for a twenty-year contract on the understanding that at the end of each five-year period the City may end the contract if it desires, and do its own lighting.

The report to the Board of Control was prepared by A. Parent, superintendent of the lighting department, and the annual charges were estimated as follows: $72.70 for the larger arc lamps; $63.15 for Class B arc lamps; $23.00 for eighty candlepower incandescent lamps, and $16 for forty candlepower incandescent lamps.

The old prices paid for incandescent lamps were $30 a year for sixty-five-candlepower lamps and $15 a year for thirty-two-candlepower lamps, so that under the new quotations the City would get eighty-candlepower lamps for $7 a year less than has been formerly paid for sixty-five-candlepower lamps.

The estimated cost of street lighting for the year 1911 under the proposed contract is $153,174. Bids submitted by four other companies resulted in three other alternative propositions, ranging in cost up to $178,279.

Washington Alleys to Be Lighted.

The commissioners of the District of Columbia have decided that by the discontinuance of 437 street lights along suburban roads, the District will save about $9,000 a year and will light over 500 alleys with the same lights, it is expected, to great advantage to the police force of the national capital. Despite some opposition the Commissioners believe they are getting the greatest value for the money by taking the lights in from roads on which are comparatively few houses and placing them in the dark and crowded alleys, where all sorts of crimes are committed by night.

Improved Street Lighting in Mt. Vernon, N. Y.

The Westchester Lighting Company has offered to install fourteen flaming arc lamps along South Fourth Street in Mt. Vernon, N. Y., if the merchants will pay for the service at about $1.50 per foot frontage per year. The lamps are to be about 150 feet apart.

Central Avenue in Fort Dodge, Iowa, has been converted into a "great white way" by the completion of an installation of tungsten clusters on ornamental standards. The Fort Dodge Light and Power Company furnishes the current and maintains the equipment.

ELECTRICAL Advertising *and* Selling

GENERAL REVIEW OF CENTRAL-STATION ADVERTISING.[1]

BY CHARLES A. PARKER.

In our previous articles we have covered in a more or less comprehensive manner the various advertising problems that the central-station advertiser is called upon to solve. In this, the last article of the series, it will not be inappropriate to gather up the threads of our entire subject and consider them briefly in their relation to each other.

The first great field of endeavor to which the central-station advertiser must devote himself is the question of electricity in the home.

We saw when we considered this matter how, from the standpoint of electrical illumination, by far the larger and most fertile part of the field has already been cultivated, leaving a somewhat limited class upon which effort must be concentrated.

THE HUMBLE HOUSEHOLDER.

Broadly speaking, the central-station advertiser must go after the more humble householder if he is to increase his company's receipts through increased electrical illumination in dwellings.

He must also keep his eye on building operations and make a special effort to have those houses wired which from their cheapness would otherwise be unbenefited by the central-station's service.

Having reached this conclusion, we saw that the nature of the central-station's advertising is largely determined by the people for whom it is intended. Mail advertising seems to be the best fitted for reaching the class of prospects now under consideration, and must have for its primary object the erasing of several preconceived notions that do more than anything else to prevent the universal adoption of electricity for residence illumination.

The first of these is (or, rather, has been in the past, for it is being rapidly overcome in these days) the popular conception of the central station as a grasping monopoly, seeking only to squeeze as much as it can from the helpless public.

The second is the mistaken idea as to the cost of installing electricity and the work required to do it. The third is the fear that, once installed, the cost of electricity is going to be so great as to be unbearable.

As far as the first of these is concerned, it has been the intent of the writer to put it up to the central-station advertiser to see to it that the central station, both by word of mouth and deed, convince the public of the mutuality of interests and its own willingness to go a little bit more than half-way.

As far as the question of cost is concerned, the prospect will only be set right on that by the constant reiteration of the fact that neither the cost of installation nor the cost of current is as great as most people suppose.

This being accomplished, sufficient stress must be laid on the superiority of electricity over all other illuminants to instill a desire for its benefits in the prospect strong enough to induce her to take action in the matter. The writer uses the feminine, because it is a fact to be borne in mind that most of the prospects are of the "gentler persuasion," and action must be taken accordingly.

It is not the purpose of this article to do more than call attention to some of the more salient points which were discussed in detail in previous articles, so we will leave the question of residence lighting with this additional suggestion: Remember that the profit there is to be secured from an extension of a central-station's residence service is not the only reward. There is the satisfaction that comes from the knowledge that the community is being benefited, that your efforts are making for better health and more happiness in your city.

ELECTRICAL DEVICES.

Leaving now the question of residence lighting, we next approach one somewhat akin to it—the question of promoting the more general use of electrical utensils in the home of the customers. In the article devoted to this subject, the writer treated it from the standpoint of a mercantile problem—which it most certainly is. Recognition of this fact and treatment of it as such are most essential prerequisites to success.

Probably the greatest danger that threatens the central station in respect to this subject is the temptation to put the utensil into the hands of the customer at a loss, with the idea of making up its cost on increased current consumption. No greater error than this could be possible.

As the writer suggested at the time, the customer either fails to appreciate the full merit of the article or gets the impression that there is an extravagant profit for the central station in the sale of current—an idea which places the company in the very undesirable light of a corporate robber.

The best possible way to handle the electrical utensil proposition is to regard it strictly as a selling problem. Of course, this does not mean that reduction, special sales, etc., are never to be considered. On the contrary, every legitimate advertising and selling scheme should be resorted to—free trial offers, mail advertising, news items, etc.

Above all, the central-station advertiser should not fail to give the exploitation of the electrical utensils full attention. For, as the writer suggested in the article dealing with the subject, this will ever be a field of increasing richness. Long after the possibilities of electricity for illumination have been exhausted there will be room for progress in the development and sale of electrical utensils.

POWER ADVERTISING.

Nothing could better illustrate the broad scope of electrical advertising than the fact that we are called upon to leave a discussion of advertising to residents to discuss advertising to promote the more general use of central-station electric power in the factory.

[1] The twelfth of the present series of articles on "Central-Station Advertising," appearing in the second issue of each month.

Perhaps there are more failures to account for in this department of central-station advertising than in any other. And the fault has largely been in the failure to realize the close connection that exists between the nature of the advertising and the end it is supposed to accomplish.

Early power advertising failed because it was for the most part too technical and too dry to be appreciated by the manufacturer. From this extreme, power advertising tended to go to the other and become so silly and so superficial as not to merit serious consideration.

The one thing to remember about power advertising—and all other advertising, for that matter—is that every word must be significant, sensible and strong; the advertiser cannot afford to be technical, verbose or dull.

In advertising to manufacturers this also must be remembered: You are advertising to advertisers. For this reason your advertising must be very carefully prepared—especially your mail matter. If it is going to receive attention, it must be of the highest possible quality, for it is with advertising matter of that sort that it is called upon to compete.

If the central-station advertiser will plan his campaigns with these facts in mind, together with one other, there is no reason why his efforts should not be crowned with the greatest success. And that other fact is that you cannot expect manufacturers to flock to the standard of central-station power service at the first suggestion. It is going to take time. Patience and persistence must necessarily be the watchwords of a power-advertising campaign.

SIGNS AND STORE ILLUMINATION.

The writer's assertion of some months ago that no electrical advertising problem is quite so much alive as the promotion of the use of electricity as an advertising medium has been more than borne out by the revived interest shown by merchants the country over in signs and store illumination.

An ever increasing number of central stations are awakening to the profit possibilities in this field of work and are showing a disposition to unite with the sign companies in pushing the more general use of electrical signs.

Not the least important factor in this revival, we must remember, is the high efficiency lamp, which is making more elaborate signs possible.

The main fact to be remembered in this connection is that there is no limit apparently to the usefulness of the electric sign. Its use is extending to all lines of business, and the variety of purposes for which it may be used are constantly increasing. The central station that does not fall in line and push electrical signs and modern electrical store illumination is most certainly asleep at the switch and losing a beautiful opportunity.

HIGH EFFICIENCY LAMPS.

Mention of high efficiency lamps brings to us the most important question the central station has been called upon to answer in a long time. How should a central station treat a lamp which, by its wonderful economy, seemed to threaten its receipts? Should an effort be made to oppose their introduction and use? Should the central station keep silent, hoping that its patrons would remain in blissful ignorance? Neither of these things are possible.

The activity of the lamp manufacturers makes it impossible for the central station to take either of these courses. If the central station will not push high efficiency lamps, the makers will, which would be the very worst thing possible for the central station, because it might result in such a sudden and so widespread an adoption of the high efficiency lamp that the central station would not have an opportunity to adjust itself to the situation.

The writer believes that it is a fact so well demonstrated that it needs no further proof that the high efficiency, instead of being a menace to the central station, is its opportunity.

He also thinks that it has been quite thoroughly proved that the only danger to the central station to be found in the high efficiency lamp is in a universal adoption taking place too suddenly—a danger which can be easily avoided if the central station gains control of the situation by its advertising, leading its patrons to look to it instead of to dealers, manufacturers' agents, etc., for new electric lamps.

WHY SOME ADVERTISING FAILS.

When we have covered in detail the topics we have just been outlining, the next subject to which our attention is naturally directed is the question as to why some advertising fails. Four general reasons are found which practically cover the situation. Advertising fails either because it lacks persistence, a co-operative spirit, good judgment, quality. There are several fundamental reasons why persistence is so essential in advertising. The first and most important is that one time, and often several times, advertisements do not bring results. People have to be kept after before they act—at least, the general run of people.

Other reasons that are scarcely worthy of mention, after the one we have already given, are the large numbers of good selling points connected with every department of electrical endeavor.

One advertisement cannot possibly cover them all, and until all are covered several times, there is always the possibility that you are not touching upon the right point of contact with a large class of prospects.

Lack of quality in advertising proceeds from a desire to be economical and is really the worst form of economy possible. It is simply throwing so much money away, because one is not willing to spend a little more to get back the first and a whole lot more in addition.

The necessity for high-class advertising comes from the fact that people have been educated to it, as well as from the fact that they judge the central station by the matter it puts out. If advertising matter today is cheap, it is unconvincing, and fails for that reason.

The lack of good judgment is simply failure to appreciate the kind of advertising necessary to produce results. Lack of co-operation is nothing more nor less than the failure of other departments of the central station to work in harmony with the advertising, hence causing the latter to fail of its purpose.

Individual advertisements, too, may have faults, causing them to miss their purpose. They may be so commonplace as not to attract attention. They may be incomprehensible or unconvincing. They may fail because they are poor typographically or because the copy is not adapted to its purpose.

All failure in advertising, however, whatever the specific reason may be, must be laid ultimately to a lack of knowledge of the science of publicity. When the central-station advertiser possesses the requisite "know how," and has the confidence of the company that employs him, there is no reason why success should not be realized.

SYNDICATE ADVERTISING.

One of the simplest ways for the central station which feels unable to employ a high-class advertising specialist to avoid failure in advertising is to take advantage of the adaptability of syndicate advertising to its purposes.

Syndicate advertising is good for central stations, not only because it relieves the central station of a large amount of responsibility, but also because it does the work well, saves money, and gives the central station the benefit of the experience of hundreds of other companies the country over.

The weakest point about syndicated advertising matter is the fact that the central station is apt to leave too much to the advertising company with which it allies itself, failing to keep the company closely informed of local conditions so that the advertising may be adapted to meet them.

Outside of this, the chief concern of the central station should be to ally itself with a company of known responsibility and ability.

In addition to the matters we have been outlining so far, there are three other topics which have interested us but have been discussed so recently as to require but little mention here. The first is the possibility of finding new ways to use electricity by means of advertising.

In the past, central stations have been known to uncover new uses for current, and the suggestion was made that the central station adopt a definite plan and pursue an advertising campaign to see just how much could be made of it. Nor was this all. The more vigorous advertising of little known or new electrical devices was advocated—especially several which are coming into public notice at the present, notably the vacuum and suction cleaner, electrical ventilating devices and electric vehicles.

From this last we are led naturally to another of our recent subjects, "The Future of Central-Station Advertising."

This is so important a matter that we strongly advise the reader not to rest content with the little mention we can make of it here, but would suggest that he take out his copy of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for September 10 and reread the article.

The question of securing your allotment of large electric signs from national advertisers, the question of underground conduits in place of overhead construction, the question of modern municipal street lighting, and the question of fighting against price-cutting contractors who are responsible for whatever inferior and dangerous construction is put up nowadays—all these are too vital questions to be dismissed with a word. The article on these questions, as well as the one on the "Ethics of Central-Station Advertising," deserve close consideration. Get out the issues in which these articles appear and go over them.

THE MAN BEHIND.

And now, in conclusion, what shall we say of the "Central-Station Advertiser"—the man upon whose shoulders must fall the burden of making central-station advertising, in all its complexity, a success? What manner of man should he be?

He must be, above all, a man who can understand and sympathize with the manufacturer puzzling over his power problems and the housewife working herself sick in a hot kitchen with sticky, constantly cooling flat irons.

He must have great breadth of vision, have ideals of the highest order, and be an adept in the art and science of salesmanship and advertising. He must be progressive, a good executive and not too closely allied with the technical side of the matter. He must be as patient as Job and be Persistence itself.

With the hope that every central station in the land may be fortunate enough to secure such a man, the writer concludes this series of articles.

Educating Boston Telephone Users.

In a series of bulletins which it is publishing in the daily papers, the New England Telephone and Telegraph Company has undertaken an interesting campaign of education as a preliminary to putting into operation the new telephone rates for the Boston and suburban districts which it adopted on August 30 on the recommendation of the Massachusetts Highway Commission.

The new scheme of rates and the zone system is in principle and in nearly all its details that recommended to the Massachusetts Commission by its technical advisor, Prof. Dugald C. Jackson. In its Bulletin No. 1, the Telephone Company makes merely a general announcement of the fact that it has accepted the new rates, and will be ready to provide service under them for a large part of its new and old subscribers by November 1. The change involves the rewriting of upwards of 100,000 existing telephone contracts, which is, in its way, hardly a less difficult task than the providing and installing of the new material that will be required by reducing multi-party to two-party lines.

In Bulletin No. 2, the Telephone Company has the following argument to make by way of showing the advantage to the majority of subscribers of the new zone plan. It may be considered as a reply to criticisms of the new rates which have arisen in some parts of the suburban district, where the existing unlimited suburban service has cost the company in many instances more than it can pay. Bulletin No. 2 says:

"Professor Jackson, the Highway Commission's expert, took careful records to ascertain the number and destination of calls for each exchange to points within the metropolitan and suburban districts. He found that, aside from calls for the seven metropolitan exchanges, only fourteen per cent of all suburban calls went outside districts composed of a particular exchange and its contiguous suburban exchanges. Hence, the great majority of suburban users would not be adversely affected by reason of the creation of such districts, but, on the contrary, distinctly benefited when all the advantages are considered.

"The present lowest unlimited suburban rate obtainable is a four-party line at $30 a year. The new lowest unlimited suburban district rate—a two-party line with divided ringing—is $21 a year in 'E' districts, $24 a year in 'F' districts, $27 a year in 'G' districts, and $30 in 'H' districts. Here, then, is a reduction of thirty, twenty and ten per cent, respectively, in three classes of exchanges, and the substitution of a two-party line with divided ringing for a four-partyline, with still other benefits.

"In this connection three important points should be considered: the reduction in the annual rate, the reduction of the toll rate to and from Boston, and the improvement in the service which will result from two-party lines with divided ringing in place of four-party lines. Each of these is a part of the same problem."

TELEPHONY—TELEGRAPHY, and WIRELESS.

TELEPHONE TRAIN DISPATCHING.—III

THE DISPATCHER'S OFFICE.

BY K. W. ENDRES.

A large manufacturing company recently had to retouch a telephone train-dispatching photograph to be used for advertising, because on the dispatcher's desk in the picture appeared a big, fat cigar and the railroad did not consider this would make good advertising for

FIG 1.—DISPATCHER ON AN EASTERN RAILWAY.

it. The superintendent of telegraph for this railroad stated at the time that never until the arrival of the telephone had he found a dispatcher smoking on the job—they didn't have time. And the sweet dispositions that dispatchers are acquiring cause much humorous comment. Furthermore, although this is, of course, strictly *sub rosa*, one can occasionally walk into a dispatcher's office and find him with his feet on the desk, his train-order book in his lap and a long green telephone cord from his chest set attaching him officially to business.

Perhaps it is needless to say the dispatchers like the telephone. Anything which will make an operator down the line answer quickly and make his life miserable if he does not answer and call with no work for the dispatcher—is certain to be deeply appreciated at the dispatcher's end of the line. On every system that has been installed, it has been most interesting to see how the dispatchers start in using the apparatus on their own responsibility previous to the official change in methods. A dispatcher will be calling an office on his Morse wire for five minutes without getting a glimmer of a response; then he will go over to the telephone cabinet and ring the office up on that. The bell is always answered at once and the things that the dispatcher says in telling the man to go over and answer his Morse usually need expurgating.

It does not need much imagination to see how the telegraphic calling, so often with the long waits for an answer, get on the dispatcher's nerves and make him irritable. It does not need their personal confirmation to make us certain of the improvement accomplished here by the telephone.

The improvement is appreciated by the men themselves, let there be no doubt of that. Practically all of them start in hostile to this innovation. They are used to the telegraph from years of association; they do not want anything new and untried (by them). They take to it grudgingly, but inside of a month they are swearing, if anything happens to put the telephone line temporarily out of commission and they have to go back to the Morse. This does not happen in one or two places; it has happened everywhere the telephone has been installed, and apparently it will continue to happen until all the dispatchers in the country have been reformed to the good-natured method of handling trains.

A circuit for handling train movements, or a train wire, as it is familiarly known, is an important part of the railroad system. For this reason all such circuits are under the direct control of one man—the dispatcher. He does all the calling on the circuit and in the telephone system it is so arranged that no operator can call another without the dispatcher's assistance. In message work, where the importance of the circuit is not so great, it seems probable that the telephone system will be arranged so that one way-station can call another without the services of any intervening operator. In all cases at present installed a message operator is employed, but as this branch of the business increases in growth it is thought its development will be along the lines indicated.

The dispatcher is supplied with telephone apparatus similar to the ordinary switchboard operator's equipment. He

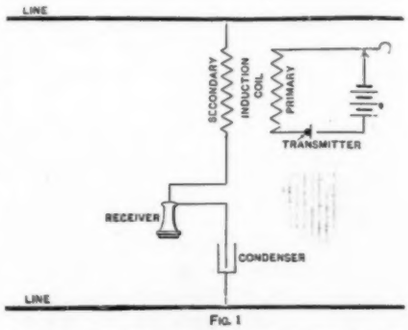


FIG. 1

FIG. 2.—WIRING OF DISPATCHER'S TELEPHONE SET.

is supposed to be connected in on the circuit all the time he is on his trick, so apparatus easy to wear is provided. As shown in Fig. 1, this takes the form of the head receiver and chest transmitter. Connections are made by a flexible cord and plug to telephone jacks mounted in the desk. A key is also wired in the transmitter circuit so that the dispatcher's transmitter can be cut out when he is listening. Fig. 2 shows the wiring of the dispatcher's telephone set. The key used is a well-known device for improving the talking efficiency of a long or heavily loaded circuit.

In addition to this, if the division is equipped with more than one circuit, the dispatcher usually has another key which permits of his shifting from one circuit to the other at will. A very

flexible arrangement is then obtained.

The above constitutes practically all the telephone apparatus which the dispatcher uses daily. Each man has his own set of instruments for sanitary reasons. They all, however, use the same key cabinet which sends the signals out on the line.

The key cabinet contains one key for each way-station that is equipped with selectors on the circuit. This is the form of sending device at present employed on all roads. One of these cabinets is illustrated in Fig. 1. When the dispatcher calls a station he gives the corresponding key a quarter turn. This sets a train of gears in motion and sends the proper direct-current signaling impulses out on the telephone line. When the station bell rings it gives the dispatcher a distinctive buzz in his head telephone informing him of the fact. He then can proceed and call another station if he so desires.

Another type of key simplifying the above scheme is shown in Fig. 3. In this a single ringing key is employed and the proper station is called by setting the pointer at the proper number or name on the dial. This device is one of the latest improvements in the dispatching field.

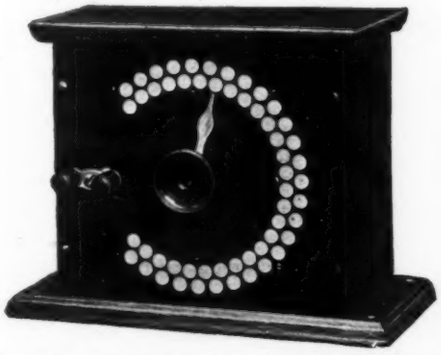


FIG. 3.—WESTERN ELECTRIC SENDING KEY.

Both the above schemes embody what is known as the individual-call system. In other words, if a dispatcher wants to call five stations for instance, he calls one after another, but can only call one at a time. This has been found to be a very satisfactory method of operation and is the system most generally employed. As a matter of fact, it is seldom that a dispatcher ever has to call in more than five or six stations simultaneously and it takes a very short time to do this with the individual call equipment.

Multiple-call equipment such as is shown in Fig. 4 is, however, used on some railroads in the West. With this master selector the dispatcher presses as many keys as he wants stations at once and they are all called by one operation, but it requires one minute to do this. It is a question whether there is any advantage in this, though, and present indications lead to the belief that this method of calling cannot compete with the more rapid and efficient individual-call mechanisms. The multi-

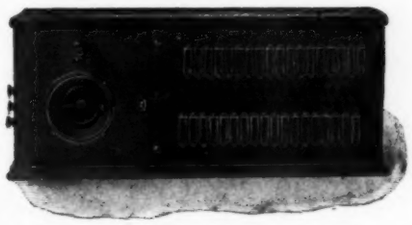


FIG. 4.—CUMMINGS-WRAY MASTER SENDER.

ple-call system operates on the basis of synchronous clocks.

Turning one of these keys in the cabinet shown in Fig. 1 operates some one selector out on the line and rings the bell at that station. In many of the present telephone-dispatching equipments local battery is employed and the selector so arranged that the bell at the way station rings until the dispatcher stops it. The later types of apparatus, however, are all coming around to a central-energy scheme where there is no local battery at the way-station selector, all current for both ringing and signaling being supplied from the dispatcher's office. With this arrangement the way-station bell rings for a definite length of time and then stops, unless held by the dispatcher. The dispatcher thus still controls the length of ring, but the mode of operation is just reversed.

In both cases, the dispatcher has a strap key on his desk. In the former case he stops the bell ringing by pressing this while he hears the answer-back buzz. In the latter he holds the ring by the same operation. This key merely relieves the dispatcher of the necessity for holding the sending key itself and performs the same function.

In addition to the apparatus and instruments which are daily handled by the dispatcher other equipment is required at his office for the successful operation of the system. A battery (of dry cells usually) is installed here whose voltage may range from 50 to 250 volts. This is for sending the signaling impulses out on the line and its voltage is dependent on the length of the circuit and the number of stations upon it.

The contacts of the sending keys are not designed to carry heavy currents, so this battery is connected to the line through the contacts of a specially designed telegraph relay. Reference to the wiring diagram of this apparatus (Fig. 5) will show how it is arranged.

Three retardation or "choke" coils are also employed in series with the telephone line and across these six-microfarads capacity is placed. These are for the purpose of absorbing the noise due to the signaling impulses. The dispatcher may wish to be talking to one station and calling another at the same time. If some means were not provided for taking care of the thump due to the high-voltage sending battery, this would be impossible. As it is, it is absorbed by these coils and condensers. The resistance across the line on the back contact of the telegraph relay absorbs the condenser discharge. The condensers and resistances around the telegraph-relay contacts are for the purpose of eliminating sparking at these contacts, thereby greatly increas the life of the relay. A similar arrangement is used on the sending key.

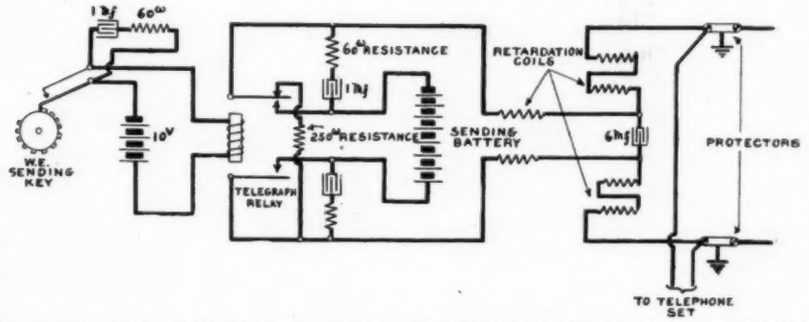


FIG. 5.—WIRING OF SIGNALING APPARATUS AT DISPATCHER'S OFFICE — INDIVIDUAL-CALL SYSTEM.

The circuit arrangement just described, with a few unimportant modifications, is that used with practically all individual-call systems in service. The circuit at the dispatcher's office for a multiple-call system is shown in Fig. 6.

To ring a station with this system the dispatcher presses the desired key or keys (Fig. 4) corresponding to the stations wanted and then operates the starting key. This starting key maintains its contact for an appreciable length of time to allow the clock mechanism to get under way and get clear of the releasing magnet clutch (Fig. 6). Closing the starting key operates the clock-releasing magnet and also the two telegraph-line relays. These send out current impulses on the line through retardation coils and by means of this operate the way-station selectors.

As the master-clock arm passes the last point on the contact dial, current flows through the restoring relay, operating the restoring magnet, which releases all the keys. A push button is also provided, by means of which the keys may be manually released in case of an error in pressing buttons.

We have covered herein the functions of the dispatcher's equipment and what is accomplished when he sends out a call. In the following paper the effect of this down the line will be described—the action of these direct-current impulses in signaling a way-station.

(To be continued.)

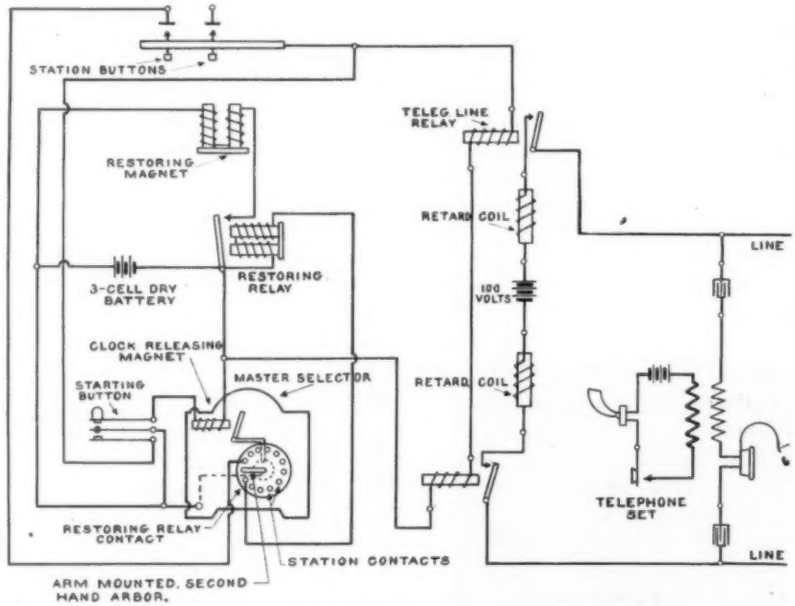


FIG. 6.—WIRING OF SIGNALING APPARATUS AT DISPATCHER'S OFFICE—MULTIPLE-CALL SYSTEM.

Reduction in Italian Telegraph Rates.

United States Consul General Jas. A. Smith, of Genoa, Italy, submits the following interesting information in a recent report:

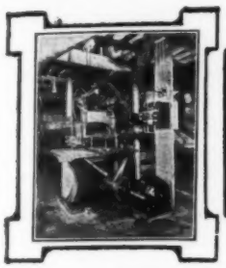
The telegraphic service in Italy is owned and controlled by the government and is under the direct management of the Ministry of Posts and Telegraphs. The rates in force were established by laws of 1870, modified in 1882. The cost of an ordinary telegram sent to any part of the kingdom is one lira ($0.193) for a minimum of fifteen words, including the address and signature, with a charge of five centesimi ($0.01) for each additional word. These rates have been for many years considerably higher than those in other European countries, especially for brief telegrams of less than fifteen words, and for a long time the commercial interests and the press have attempted to persuade the Italian Parliament to reduce them. Important obstacles to this action were that the lines, with their limited capacity, could not properly handle the increased business resulting from lower rates, and that diminished receipts were feared.

The ministry has overcome the first obstacle by adding fully 25,000 miles of wire during the past three years, with thirty-nine additional direct lines between the large centers of commerce and industry, and by installing over 1,200 new high-capacity instruments (262 Hughes and Baudot and 1,000 Morse). A careful estimate of the amount of increased business to result, based upon the experience of other European countries, showed that in the next five years from a total of 58,060,000 telegrams, yielding an income under existing rates of about $14,000,000, the traffic probably will show a total of 86,990,000 telegrams, with an income of over $16,000,000, a gain for the administration of fully $2,000,000 in five years. Increased business will, of course, result in some additional expense for employees, but it is argued that the result of reducing the minimum number of words in a telegram from fifteen to ten will be proportionately less work for the personnel, and therefore the increase in expense for operators will be less in proportion than the increased income from additional traffic. These considerations have prevailed upon Parliament to approve a law granting a material reduction in the rates charged. The new law goes into effect on December 1 next.

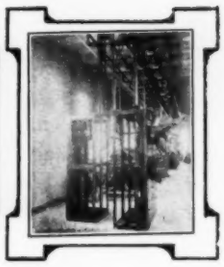
The rates to be charged are as follows for messages sent anywhere within the kingdom: Ordinary telegram, minimum ten words, sixty centesimi ($0.115), with $0.01 for each additional word; urgent telegrams (former rate three times that for ordinary message), 1.8 lire ($0.347), with $0.03 for each additional word above ten. Ordinary telegrams directed to newspapers or press agencies from 9 p. m. to 6 a. m. are charged $0.115 for twenty words and $0.01 for each additional two words.

Wireless for Submarine Boats.

A good deal of secrecy has been associated with the British naval experiments which are being conducted with wireless telegraphy, and whose purpose is to establish communication between submarines and the parent ship. At first the experiments promised to be hopeless. However, results have now been secured which have convinced the authorities that eventually success will be obtained. As a fact communication has been established, though of a rather fitful character. The establishment of a reliable method of communication would not only increase the assurance of safety, but would considerably increase the fighting effectiveness of the submarine.



Industrial Power



ELECTRICAL MINING NOTES.

BY SIDNEY F. WALKER.

In the early part of last year, J. Glynn Williams, the electrical engineer of the Moresby Collieries near Whitehaven, England, voiced the feeling of a very large number of those engaged in mining work, and of those interested in mining, by asking all who were so interested to join the proposed Institution of Mining Electrical Engineers. The qualifications were necessarily at first rather loosely defined. Membership of the Institution of Electrical Engineers naturally qualified for membership of the proposed new institute, and a considerable number of members of the older institution immediately joined. The other qualification was actual engagement in looking after an apparatus in a mine.

The Institution, or, as the Board of Trade has obliged it to call itself, the Association, has already done a certain amount of valuable work. There have been the usual difficulties attendant upon the formation of a new body of this kind. The Association was very fortunate indeed in securing for its first president, a gentleman who combined in his own person a thoroughly practical and theoretical knowledge of electricity and of mining. William Maurice, the president, has been for some years the manager of Hucknall Colliery in Nottinghamshire, and before adopting the profession of mining, he served his time with a firm of electrical engineers, and also did a considerable amount of work for them in putting down electrical plant. In fact, he gravitated from electrical work into mining, during the time that he was left as electrical engineer in charge of a plant that his firm had fitted up at a colliery. He has written several books upon electricity. Mr. Maurice has taken upon his own shoulders practically the whole of the troublesome work of drawing up Articles of Association, such as are required by our Board of Trade, and of piloting the affair through the somewhat difficult shoals of officialism. The Association is not yet quite out of the wood, from the official point of view. It has not yet been incorporated, at the time I write, but I understand that all difficulties have been smoothed over, and that in a short time, the Association will be fully launched, under legal auspices.

The Association of Mining Electrical Engineers is organized very much on the lines of the Colliery Managers' Association, to which it rather closely corresponds. The Colliery Managers' Association has been in existence for a good many years. It was formed in something the same way. From the feeling that existed among colliery managers, the men who were responsible for the working of collieries, and who were *au fait* with all the numerous little difficulties to be met with in the working of collieries, that some means should be found of their meeting together at times that were convenient to them, to discuss matters of common interest.

During the last session the greater portion of the time of the Association branches was taken up in discussing a paper dealing principally with "Shock," prepared by the president of the Association. A great deal of very valuable information was obtained from the members at the different branches.

Unfortunately the use of electricity in mines has been attended, during the last few years, with a very heavy toll of life. A very large number of deaths have taken place. Sometimes men in charge of the apparatus have been killed, and sometimes other men who have accidentally touched some piece of metal that should in no way have been connected with the power service. The result of these accidents has been a considerable setback to the use of electricity in mines. A great number of colliery managers who had adopted electricity for driving coal-cutting machines, have displaced it by compressed air, the air being compressed as near the working face as possible.

At a colliery in the county of Durham that I visited a few weeks ago, the manager told me that he would not have electrical apparatus anywhere about the mine except in the immediate neighborhood of the pit bottom.

Again and again accidents are reported, where the insulation of some part of the cables, or of a switch or distribution box, has been cut through by some metal, the metal becoming alive and making everything else alive that is in metallic connection with it; the result being that some object, such as a haulage rope, or the iron frame of a mine wagon has become charged.

ARMORED VERSUS UNARMORED CABLES.

This leads to the question that has been very fully discussed at the meetings of the Association of Mining Electrical Engineers, and also at the meetings of other bodies, as to whether it is wiser to armor cables or not. The more general practice is to use armored cable, and for the reason that it is not so liable to be broken by falls, and is also not so liable to be cut through by the sharp edge of a girder or any piece of metal that happens to come in contact with it. On the other hand, however, any heavy pressure brought to bear upon the armor, as when there is a heavy fall of rock, will tend to drive the armor through the insulation and to render it alive. If each conductor is properly protected by fuses and circuit-breakers, and if the armor is intact up to the point where it becomes alive, the conductor should be immediately cut off from the supply service and all danger of shock should cease. There are, however,

difficulties in the way of this. In the first place it is often inconvenient for the supply of current to be cut off, and the armor may not be intact right up to the point where it becomes alive. If the armor is earthed at the pit bottom, say, where good earth can always be obtained, and it is intact everywhere, there should be no difficulty about the protection of the men about the mine from shock. What often happens is that a cable may be broken, however well it may be armored, by a heavy fall of rock or by runaway mine wagons. I have seen a very heavily armored cable, the conductor itself being of fairly large size, cut clean in two as by a pair of shears, the cut having been made by the wheel of a mine wagon that ran over it. The difficulty that arises where breakages of this kind occur is, unless the two sides of the armor are carefully connected together by good conductors so that the total resistance of the armor right through the length of the cables is small, the protection afforded by earthing the armor is lost beyond the point where the break has occurred.

Somewhat similar difficulties occur in connection with the iron cases that are now almost universally employed to inclose distribution boards, switches, fuses, etc., at all places where an inflammable mixture of gas and air may come. Unless the box itself is carefully connected to the armor it may become alive, and may give a fatal shock.

THE QUESTION OF EARTH.

The question of earth is a very difficult one indeed in a coal mine. There is no difficulty whatever in obtaining good earth on the surface or at the pit bottom. The engines (which are connected with the boilers and the boilers with a supply of water) make as good earth as it is possible to obtain. At the pit bottom also there is nearly always a large sump, practically a large tank, right at the bottom of the shaft, which receives all the draining of the water from the shaft and which makes very good earth indeed. In the workings, however, it is a very difficult matter. Earth may be obtained in the workings, but the chances are against it. If there is a piece of ground some distance from the pit bottom that is always wet, this ground is not always connected electrically with the sump at the pit bottom, and therefore there may be the resistance of the other strata between it and the pit bottom, which is often very high, reducing the effect of the earth very considerably.

Modern practice in coal mines is resolving itself into carrying earth from the pit bottom right into all the workings wherever cables may be laid and wherever electric motors may be used. In one colliery in South Wales, where there have been no accidents and where the whole thing has been very successful indeed, an old wire rope is carried from the sump through all the roads, the rope being laid loosely in the ground and careful connections made between it and the armor, and between it and the distribution, switch boxes, etc., where required. Care is required in the selection of the old wire rope for this purpose. The modern lang-lay wire rope will probably answer very well, as also will the locked-coil rope, but a rope of the older formation may have a very high resistance indeed. In the older method of the manufacture of wire ropes, a certain number of wires were twisted together in one direction, say to the right, to form a strand, and a certain number of strands were twisted together round a core in the opposite direction, say to the left, to form the rope. With this arrangement, as the rope wore, the wires on the outside were cut through at different places by the friction to which the rope was subject, and this meant that the rope itself, when it was taken off use for haulage or winding, was made up of a number of very short lengths of individual wires held together by the twisting of the rope, but making very poor electrical connection with each other. In the locked-coil and lang-lay ropes a different set of conditions rules, and the worn rope may be taken to be fairly solid.

Another method that has been employed is to run a galvanized-strand signal wire along the road in the neighborhood of the cables, and to connect the armor, switch boxes, etc., everywhere to it. One of the most promising methods of protecting cables that I have seen was described to me by one of the managers of a very large colliery concern in South Wales, where electricity has been adopted for every purpose. Stone walls are built along all the roads, and the cables, which are well armored, are supported upon the walls by substantial supports that prevent any crushing action being brought upon the cables themselves owing to the squeeze of the mine. The building of the stone walls is expensive at the start and for this reason firms who are not very strong financially cannot indulge in it. As the manager pointed out to me, however, by the time the colliery is worked out they will be very much to the good, taking into consideration the cost of the timber that will have been saved and the greater security of the cables, and the absence of stoppages from the parting of cables. The stone walls require to be very substantially built in a great many collieries because of the enormous crush that comes upon the seam from the overlying strata. It is not difficult, however, to provide for this.

One method of earthing that has been employed is the use of the delivery pipes from pumps. The opinion of the electrical engineers who are engaged in mining work, however, appears to be very strongly against it. In the one case in which it has been employed, care is taken that no pipe shall be used for the purpose that is not always full of water. The danger with the use of water pipes in this way is, if a pipe is temporarily empty of water a portion of it may be alive and may give a shock sufficient to kill.

THE EFFECT OF SHOCK.

One of the most interesting pieces of information which came out in the course of the discussions upon shock was the fact that the common belief that no harm is done unless death ensues is incorrect. Repeated cases were given where men had received very severe shocks, in some cases not being rendered insensible for more than a few minutes, in other cases requiring the use of "first aid" to bring them round who suffered very severely from the shocks though they recovered and were able to resume their work as before.

EXPLOSIONS IN SWITCH AND DISTRIBUTION BOXES.

Another source of trouble that has come to light in the course of the discussions that have taken place is the possibility of explosions in, or in the neighborhood of, switch and distribution boxes. It is now the common

practice to provide gas-tight boxes wherever a switch or a distribution connection is required, if gas is likely to be present. The difficulty in connection with these switch boxes is in making a gas-tight joint to the box. The box must be made to open for replacing fuses, making connections to switches or attending to switch contacts. If it is opened frequently the joint between the cover and the case is apt to become loose. In many forms of switch boxes the joint was made, in the early apparatus, by means of gaskets of rubber. If the rubber was of sufficient thickness, if it could be insured that the rubber was always in place between the cover and the body of the box, and if there was the same thickness of rubber everywhere when the box was closed and the rubber squeezed into position, there was a fairly good chance of the box being gas-tight. But it was only a good chance. The arrangement of any gasket for a gas-tight joint where the joint has to be unmade and remade more or less frequently is always weak. Men attending to electrical apparatus underground have not too much time. When faults occur everybody is rushing them to get the thing right and there is a tendency to leave the gasket out, or, at best, not to fit it properly. It is now pretty clearly understood that the very best joint for the purpose is made with wide flanges, and metal to metal. Incidentally I may mention that I made this discovery in connection with electrical apparatus for use with signals in mines over thirty years ago.

In the case of switch boxes, unless the joint is perfect, gas is constantly leaking through into the box, and in case of the atmosphere inside the box becoming explosive and being fired when a switch is opened or when a fuse blows, the ignition may be communicated through the imperfect joint to the atmosphere outside, if it is explosive or if there should happen to be a cloud of coal dust present at the moment. When the joint is gas-tight, as it is with metal to metal carefully machined and with broad flanges, it may happen that a certain quantity of an explosive mixture is inclosed in the box when it is opened to replace a fuse or for another purpose. Providing that the box is sufficiently strong, this does not matter. A small explosion may occur inside the box which may do a certain amount of damage to the parts of the switch, but nothing further happens. This, however, brings up another subject that is of great importance, viz., that all of these switch boxes should be sufficiently strong to withstand the force of the explosion of an inflammable mixture that can be inclosed within them. There is no difficulty whatever in providing this, and it is a matter that is very easily tested in the works, as the explosive force of a mixture of ordinary illuminating gas and air is very similar to that of mine gas and air.

THE CRUX OF THE WHOLE THING.

From the discussion which has taken place during the last session of the Association of Mining Electrical Engineers, from the experience of some thirty-five years past of the use of electricity in mines, and from a careful study of the conditions ruling where accidents have taken place, to my mind the one fact stands out very clearly, viz., that the crux of the whole thing lies in care and insulation. Every one of the accidents that have taken place, whether they have led to shock or to fire, could have been traced to the absence of one of these.

Defective insulation of motors, cables, parts of switch gear and pretty well every part of the apparatus, opens the door to connection between the power service or the lighting service (which in the United Kingdom, may be from 200 volts up to 3,000 volts, and on the surface up to 6,000 volts) and the conductors, and once connection has taken place between a conductor forming part of the power service, and any other metal body the question of whether an accident shall take place is purely one of chance. The first requisite then is to keep the insulation up at all costs. I would go so far as to say, that if this cannot be done, that if the cost of maintaining the insulation in a satisfactory condition is prohibitive, then such a mine would be well advised to abandon the use of electricity entirely.

The other matter that has been mentioned, care, is also of the very highest importance, and its want is responsible for a very large number of the accidents that have taken place. Allowing the insulation to become faulty is in itself due to want of care. Apart from that however, a great many accidents have been due to the grossest want of care. Skilled men in a number of instances have been killed through deliberately handling live conductors, or going into the neighborhood of live conductors under conditions where they have not room to work, and where the slightest wrong movement on their part might bring hand or head into connection with a live conductor at high pressure.

Incidentally it may be mentioned that covering joints in wet collieries is often a very disagreeable and a difficult matter. In a shaft, for instance, where there is nearly always water present, if a cable is exposed, it is almost an impossibility to re-cover it in such a manner that no water shall be left under the covering. If the current should accidentally have been left on while the covering process is proceeding, or if it should be switched on accidentally, or again if a leakage current should reach the exposed portion of the conductor, the consequences to the man who is engaged in covering the joint may be serious.

PRESSURES EMPLOYED IN COAL MINES.

The pressures employed in mines are steadily increasing. With the increased distances underground to which mine roads are extending, and with the increased quantities of work to be done at these distances from the pit bottom, it has become absolutely necessary to use higher pressure. In a case upon which I advised some years ago, I found the difference between working at 500 volts, and 2,000 volts, in the matter of the cost of cables, came out about $35,000. It is now common practice to use pressures of 3,000 volts underground, occasionally transformed down to 440 or 500 volts for particular parts of the service. Haulage motors take the 3,000 volts direct. Pumping motors do the same in some cases, and in others the pressure is transformed to 440 or 500. For coal-cutting machines the lower pressure is always employed. It would be far too dangerous to use pressures of 3,000 volts at the face of the coal. As it is, the difficulty of maintaining the insulation of cables connecting the service with the motor of a coal-cutting machine is sufficiently great even at 500 volts. Motors working fans underground are sometimes worked at 3,000 volts, and sometimes at the lower pressure. It may be mentioned that elec-

trically driven fans are performing very useful work underground in coal mines, for boosting the air current. In some collieries, particularly those worked on the bord-and-pillar system, where the plan of the mine is like a checker board, the problem of ventilation is often a very difficult one, and fans placed in different parts of the mine, to direct air currents up certain roads, or to suck the return air down certain other roads, are of very great service. The use of electric motors for driving the fans has been a great boon to mining engineers. Compressed air is the alternative, and it is exceedingly wastefull, while the piped distribution system is expensive, and costly to maintain.

PORTABLE ELECTRIC LAMPS IN MINES.

The portable electric lamp for use in coal mines has been the dream of the electrical engineer ever since the first introduction of the incandescent lamp. Many attempts have been made to solve the problem, but at the present time, in the United Kingdom at any rate, I believe there are only two collieries where portable electric lamps are in use to any great extent. In fact, only one has gone in for it largely, viz., the South Hetton colliery in the county of Durham. Through the courtesy of the manager, Seymour Wood, I had the pleasure of inspecting the lamp station a few weeks ago, and of seeing the whole arrangements. It is the Sussmann lamp that is in use there. The lamp is identically similar with the one that was introduced by the Sussmann Company nearly twenty years ago. The South Hetton Company, however, handles the whole thing itself. It makes the accumulators, repairs them, and does practically everything. I understand that there are some 2,000 lamps in use at these collieries. The arrangement of the lamp cabin is very similar to that of an oil-lamp cabin. The lamps when they come up out of the pit are dismounted, the accumulators taken out and put on the charging bench. If on test any pair of accumulators is found weak, it is taken into the repairing shop, the plates taken out and the whole thing remade. There are constantly a number of plates in process of manufacture, another lot of plates in process of formation, and another lot being put together ready for use in lamps. In the lamp cabin, after the cells have been charged, they are put in pairs, into the tinned iron case which holds them, the cover with the lamp and switch fixed on the top by screws, the lamp is switched on temporarily to see that all is right, and the whole thing is placed in the rack over its proper number. At every colliery, each miner's lamp has a number, and there is a corresponding number on the rack where it stands when it is ready for use. In the morning when the miners are going down the pit, they come to the little window of the lamp cabin, call out their numbers, and the lampman hands them their lamps from the rack. Usually each miner switches on his lamp temporarily to see it is alright, and then switches it off again. The lamps which I saw come up out of the pit after a days work were then giving very much more light than the ordinary oil lamp does. The managers have special lamps giving considerably more light, and weighing rather more than those used by the miners. When I went down the pit, I had the manager's own lamp, which gave a light of about nine candles.

Electrical Power for Mica Mine.

According to *The Mining World*, an investigation of the electrical possibilities of the property of the Westinghouse Electric & Manufacturing Company, near Custer, S. D., has just been made by Paul M. Lincoln. The company operates seven mica mines near this place, and ships large quantities of this material east monthly. It is now figuring on the possibility of constructing an electrical transmission line from the plant of the Dakota Power Company, at Pactola, to the mines. This line, if constructed, would cost approximately $60,000 and would transmit power at 22,000 volts. It is expected to give to the town of Custer and the various mining projects right around it, about 750 horsepower and by coming through Keystone and Hill City, transmit electrical power to the numerous mining properties in those sections.

A Large Electromagnetic Clutch.

There has recently been installed by C. E. Lugard & Company, Chester, England, a large electromagnetic clutch for driving a blast-furnace blowing engine at the works of Cochrane & Company, Ltd., Middlesbrough. A motor capable of giving 700 horsepower continuously, or 1,000 horsepower for one hour at seventy-five revolutions per minute, is directly connected to a vertical blowing engine, by Richardson, Westgarth & Company, Ltd., which has a flywheel weighing twenty-three tons and sixteen feet nine inches diameter. For starting it was decided to adopt a method of gradual acceleration, and by arrangement with Lugard & Company a Vulcan patent magnetic clutch has been utilized. The clutch, which is stated to be the largest electromagnetic clutch in the world, is seven feet three inches diameter, weighs six and one-quarter long tons, and is capable of transmitting 1,000 horsepower at seventy-five revolutions per minute. It was specified that the blower should be started up so gently and slowly that the demand from the gas-engine generator would not exceed 1,000 horsepower, and since its installation it has been possible to start up in one minute, the load on the gas-engine generator not exceeding 350 horsepower. The electrical energy required to keep the clutch in operation is two kilowatts.—*The Mechanical Engineer.*

Electric Drive in a Tannery.

The fire which destroyed the tannery of the Logan Tanning Company, Pictou, N. S., in the earlier part of this year, may prove to have been a blessing in disguise, for the company in rebuilding is installing an electric generator and motor to drive all of the machinery. The generator is a 125-kilowatt, three-phase, Canadian General Electric Company's alternator, and the motors include three of forty horsepower each, two of twenty horsepower, and two fifteen-horsepower motors, all by the same manufacturer.

Electric Pump for Emergency Use.

A report from Prescott, Ariz., states that the Arizona Central Copper Company has decided to use a powerful electric pump in the exploration work now going on in its principal mine. This pump, it is explained, was chosen on account of its being able to start on short notice in order to prevent delays which might occur from an unexpected flow of water. Steam pumps are not suitable in emergencies of this kind.

Motors Wanted in Canadian Works.

The Nova Scotia Steel & Coal Company, a well-known Canadian concern, is in the market for about 1,000 horsepower in electric motors.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

MONTREAL STREET RAILWAY.

The report of the Montreal Street Railway for the month of August and eleven months ended August 31, compares as follows:

	1910.	1909.
August gross	$396,828	$ 355,229
Expenses	216,314	180,582
August net	182,514	174,647
Charges, rents, etc.	69,891	62,026
August surplus	112,624	112,620
Eleven months' gross	3,889,475	3,492,776
Expenses	2,830,237	2,046,598
Eleven months' net	1,651,644	1,446,178
Charges, rents, etc.	516,744	450,601
Eleven months' surplus	1,134,901	995,576

INTERBOROUGH RAPID TRANSIT.

The report of the Interborough Rapid Transit Company for the two months ended August 31, compares as follows:

Two months ended August 31:	1910.	1909.
Gross operating revenue	$4,156,766	$4,010,332
Operating expenses	1,813,704	1,631,045
Net operating revenue	2,343,062	2,239,287
Taxes	298,551	299,670
Non-operating income	58,773	96,979
Gross income	2,103,309	2,126,595
Interest, rentals, etc, including Manhattan guarantee	1,770,385	1,797,289
Operation per cent.	43.63%	41.92%
Passengers carried	80,386,104	77,769,606

KINGS COUNTY COMPANY.

The report of the Kings County Electric Light and Power Railroad Company for the month of August and eight months ended Aug. 31, compares as follows:

	1910.	1909.
August gross	$ 344,964	$ 292,734
Expenses	169,997	153,308
August net	174,966	139,426
Charges and expenses	107,348	83,603
August surplus	67,618	55,823
Eight months' gross	2,793,614	2,433,799
Expenses	1,337,874	1,178,122
Eight monts' net	1,455,740	1,255,677
Charges and depreciation	824,499	698,084
Eight months' surplus	631,241	557,593

NORTHWESTERN ELEVATED.

The Northwestern Elevated Railroad Company has issued its pamphlet report for year ended June 30, 1910. The income account compares as follows:

	1910.	1909.
Gross	$2,632,039	$2,540,883
Expenses	1,055,688	995,818
Net	1,576,353	1,545,064
Charges, taxes, etc.	1,200,254	1,189,288
Surplus	376,098	355,776
Preferred dividends	150,000	.....
Surplus	226,096	355,776
Earned on $5,000,000 preferred stock	7.5%	7.1%

PHILADELPHIA RAPID TRANSIT.

The Philadelphia Rapid Transit com- has issued its pamphlet report, for the year ended June 30, 1910. The income account compares as follows:

	1910.	1909.
Gross	$17,991,100	$18,317,529
Expenses	9,886,759	9,364,737
Net	8,104,342	8,952,792
Other income	510,256	480,462
Total income	8,614,598	9,433,255
Taxes and license	1,569,858	1,464,952
Balance	7,044,741	7,968,303
Fixed charges	8,374,463	8,192,572
Deficit	1,329,723	224,270
Passengers carried	432,884,253	464,264,656

The report would, it is stated, have been very different had it not been for the motormen's strike, which lasted from February 19 to April 25.

Two courses were opened with respect to the extraordinary expense, either to charge a portion of it off each year, or to close the whole account into profit and loss; the latter course was adopted, as the management felt it was for the best interests of the property to have the whole strike expenses closed out on the accounts.

ONTARIO POWER COMPANY.

The Ontario Power Company of Niagara Falls, and the Ontario Transmission Company, Limited, report for August, 1910, compares as follows:

	1910.	1909.
Gross earnings	$ 62,660	$ 48,899
Operating expenses	12,191	11,750
Net earnings	50,469	37,149
Other receipts	7,250	630
Total net income	57,720	37,779
Interest	50,160	27,146
Surplus	7,560	10,633

AMERICAN LIGHT AND TRACTION.

The report of the American Light and Traction Company for the month of August and eight months ended August 31, compares as follows:

	1910.	1909.
August gross	$ 267,302	$ 236,410
Expenses	11,516	8,215
August net	255,786	228,195
Eight months' gross	2,318,057	2,017,491
Expenses	79,862	71,405
Eight months' net	2,238,195	1,946,086

MEXICAN TELEGRAPH COMPANY.

The report of the Mexican Telegraph Company for the quarter ended September 30, (partly estimated) compares as follows:

	1910.	1909.
Traffic receipts	$ 187,500	$ 157,000
Expenses	42,000	38,000
Net	145,500	119,000
Other income	25,500	25,500
Total income	171,000	144,500
To Mexican government	9,500	7,500
Balance	161,500	137,000
Dividends	89,735	89,735
Surplus	71,765	47,265
Previous surplus	2,400,277	2,144,308
Total surplus	2,472,041	2,191,573

CENTRAL AND SOUTH AMERICAN TELEGRAPH.

The report of the Central & South American Telegraph Company for the quarter ended Sept. 30, (partly estimated) compares as follows:

	1910.	1909.
Traffic receipts	$ 408,000	$ 371,000
Expenses	173,000	163,000
Net	235,000	208,000
Other income	3,200	2,200
Total income	238,200	210,200
Dividends	143,565	143,565
Surplus	94,635	66,637
Previous surplus	2,019,210	1,562,890
Total surplus	2,113,845	1,629,525

SOUTH SIDE ELEVATED.

The South Side Elevated Railroad, of Chicago, reports gross earnings to the Railroad and Warehouse Committee of Illinois for the year ended June 30, 1910, of $2,348,135, an increase of $118,557. The total number of passengers carried in the year ended June 30, was 44,936,240, compared with 42,607,120 in the previous year. The daily average number of passengers carried during the year was 123,113, compared with 116,732 in the previous year.

Annexed is the income account for the year:

	1910.	Increase.
Gross earnings	$2,348,135	$118,557
Operating expenses	1,595,170	49,152
Net earnings	$ 752,965	$69,405
Bond interest	360,000	.....
Balance	$ 392,965	$ 69,405
Rentals paid to Chicago Junction Railroad	93,080	*21,460
Balance	$ 299,885	$ 90,865
Dividends	51,149	51,149
Balance	$ 248,736	$ 39,716
Depreciation	50,000	.....
Surplus	$ 198,736	$ 39,716

HUDSON & MANHATTAN.

The income account of the Hudson & Manhattan Railroad Company for the quarter ended August 31, 1910, giving the individual months, is as follows:

	August.	July.	June.	Total for Quarter.
Gross	$308,480	$302,727	$324,169	$935,376
Operating expenses and taxes	132,940	124,683	133,469	391,092
Net	175,540	178,044	190,700	544,284
Interest on bonds outstanding	243,958	243,958	243,958	731,874
Less interest charges on construction	73,020	73,020	73,020	219,060
Balance	170,938	170,938	170,938	512,814
Other charges	20,856	19,609	20,418	60,883
Total deductions	191,794	190,548	191,357	573,697
Deficit	16,254	12,504	658	29,393

BOSTON SUBURBAN ELECTRIC.

The Boston Suburban Electric Company's report for August and eleven months compares as follows:

	1910.	1909.
August gross	$107,791	$111,521
August net	43,300	43,055
Balance available for dividends	28,401	29,162
Eleven months gross	837,076	858,815
Eleven months net	235,198	231,091
Balance available for dividends	74,475	77,744

RAILWAYS COMPANY GENERAL.

The Railways Company General has issued its pamphlet report for the year ended June 30, 1910. The date on which the company's fiscal year ends has been changed to December 31, and hereafter the reports of the company will cover the calendar year. The income account for the years ended June 30 are compared as follows:

	1910	1909	1908
Total income	$ 90,313	$ 91,467	$167,071
Expenses and taxes	22,226	15,070	161,392
Net profit	68,087	76,397	5,679
Dividends	16,800	.....	.....
Surplus	51,287	76,397	5,679
Previous surplus	*306,279	285,882	280,203
Total surplus	357,566	362,279	285,882

*After deducting extra dividend of ten per cent paid September 15, 1909.

New Electrical and Mechanical Apparatus and Appliances.

Asbestos Insulated Rectangular Wires.

For several years the D & W Fuse Company, of Providence, R. I., has been manufacturing an asbestos insulated wire known under the trade name of "Deltabeston." Its excellent insulating and heat-resisting properties have brought it into extensive use for railway and hoisting motor, field, armature and controller coils, arc lamp magnets, heating units, and for many other devices subjected to severe overloads or high temperatures.

Deltabeston wire requires a temperature of 1,000 degrees Fahrenheit to start the disintegration of its asbestos covering, and a temperature of 1,800 degrees to decompose the asbestos completely. Thus a coil can be run at a dull red heat without causing a breakdown in its insulation.

These qualities created a demand for Deltabeston wire of rectangular section as well as round. At first it seemed an easy matter to treat a square or a flat wire in a manner similar to round Deltabeston, but it was only after a large amount of time and money had been expended in painstaking experimenting that the present method was perfected.

During the past year the D & W Fuse Company has sold a large amount of rectangular Deltabeston, made with strong, uniform insulation of practically the same thickness on the corners as on the flat surfaces.

The advantages of square or flat wires for certain purposes are numerous. For instance, it is said that about a ten per cent greater copper section can be put into a given winding space by the use of rectangular wires than by employing round conductors. This is due to the perfect bedding secured by using wires with flat sides, between which practically no space is wasted.

The reduction of lost space in a winding is advantageous in two other ways: first, less compound is needed to fill a coil if it is to be impregnated; and second, the heat radiation is greatly improved by avoiding large spaces filled with a comparatively poor conductor of heat.

An advantage of almost equal importance is that certain features of winding operations are facilitated by the use of flat-sided wires, especially when large conductors must be handled. Thus, there is a great tendency for round wires to cut into any flat insulation between layers, due both to the tension in winding and chafing in service. With flat wires the pressure of the conductors on the between-layer insulation is distributed over large surfaces, instead of being applied in lines at the centers of every wire. Therefore, greater stress can be applied in winding a flat wire with less chance of injuring the insulation.

The engineering department of the D & W Fuse Company has made a careful study of the uses and relative advantages of round and rectangular heat-proof wires in various conditions of service, and the department is ready at any time to assist coil manufacturers and railway companies with their winding problems.

New Guayule Plant in Texas.

It is reported that the Diamond Rubber Company, of New York, which recently obtained a permit from the Secretary of State of Texas to do business in that state, will erect a large factory near Marathon, Tex.

Much of the guayule shrub is raised in that territory, and this would be used by the company in the manufacture of its product.

Electric Vehicle for Transportation of Gun Powder.

The Studebaker Company is making delivery to the Union Metallic Cartridge Company of Bridgeport, Conn., one of their Model 26 machines, which has some unique features in its equipment in view of the dangerous nature of the load to be carried.

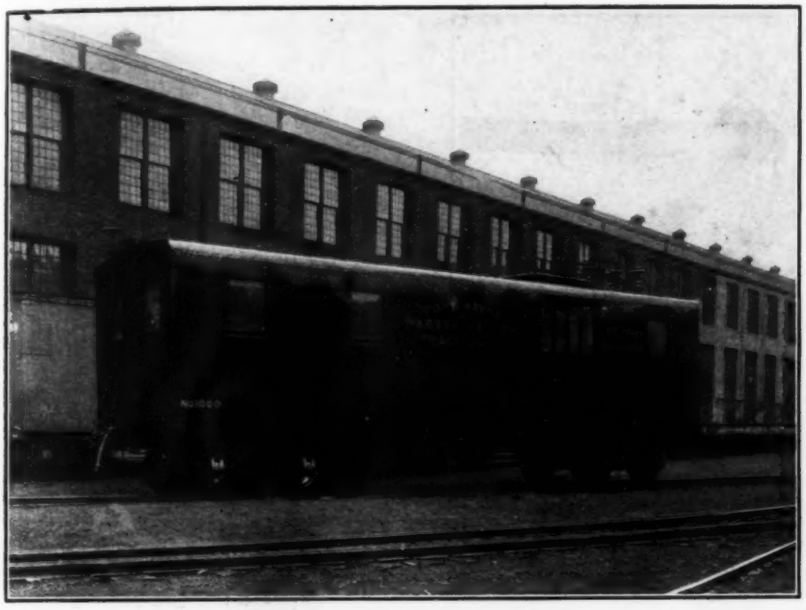
The matter of suitable power vehicle for the transportation of powder from the outlying powder houses to the manufacturing establishment of the Union Metallic Cartridge Company has been under consideration for about a year and a half, and as the result of their consultation with the Studebaker engineers it was proved that an electric wagon could be so equipped as to insure absolute protection against any danger from ignition to the powder. The compartment of the vehicle in which the powder will be carried is practically hermetically sealed and is constructed in such a manner that it is absolutely devoid of the use of metal in any exposed manner which would likely endanger friction and consequent ignition.

ELECTRIC VEHICLE FOR TRANSPORTING GUN POWDER.

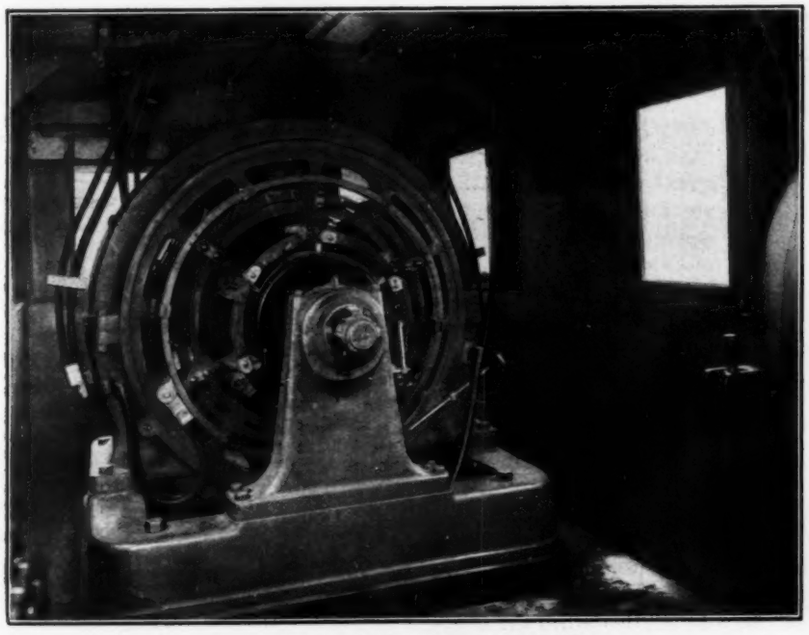
The controller and such other portions of the apparatus at which sparking is likely to take place under ordinary circumstances have been immersed in oil, and all the wiring of the vehicle has been done in metallic conduit

with the greatest care possible to insure safety. This machine is equipped with sixty-four cells of type "A-6" Edison battery and the vehicle will be run over the road from New York to Bridgeport in making delivery to prove its practical utility in every particular.

Conditional upon the satisfactory performance of this machine the Studebaker Company has orders for additional equipment. This case is another illustration of the adaptability of the automobile to new fields.



VIEW OF PORTABLE SUBSTATION.



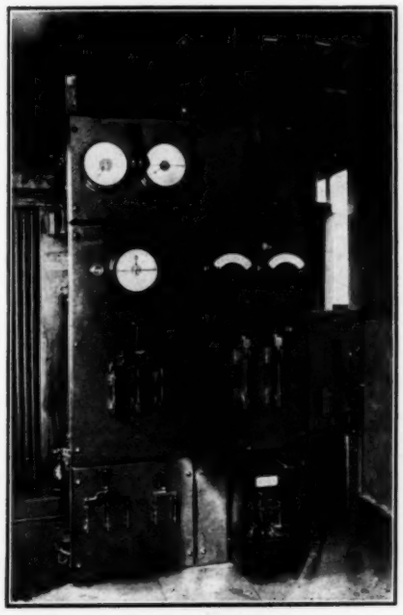
INTERIOR OF PORTABLE SUBSTATION.

New Portable Substation of the Fort Wayne and Wabash Valley Traction Company.

The Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., recently completed for the Fort Wayne and Wabash Valley Traction Company a portable substation which is now in operation on the latter company's electric lines in the vicinity of Fort Wayne.

The general arrangement of the electrical apparatus in the car includes no great departure from previous practice. The lightning arresters are located at one end of the car; close to this end are the oil circuit-breakers, and the transformers; the switchboard is near the center, and the rotary converter is near the other end. A liberal space is allowed near the switchboard in the middle of the car, and there are no high-voltage wires in the neighborhood of the board, hence complete safety is secured for the operator.

The all-steel car was made in accordance with Master Car Builders' rules and regulations. Its dimensions are: Length over end sills, forty feet; width, over all, nine feet, five inches; truck centers, twenty-seven feet, and height from floor to underside of roof at center, eight feet, nine inches.



VIEW OF SWITCHBOARD.

The 500-kilowatt, 550-volt, six-phase, twenty-five-cycle rotary converter was constructed in accordance with Westinghouse standard specifications. The switchboard comprises two panels of black marine finished slate. The ten-ampere, three-pole, 35,000-volt, type E, oil circuit-breaker is operated by hand from the switchboard; thus, distant control of the high tension incoming line is provided. The three-phase transmission circuit, of 33,000 volts and twenty-five cycles, is brought into the car through three 300-ampere, 33,000-volt disconnecting switches.

There are two 33,000-volt primary, lowering transformers of the oil-insulated self-cooled type; they are double-V connected.

The Acco Lamp Hanger and Cut-Out.

Of interest to the electrical industry is the announcement that the George W. Armstrong Company, 617-31 West Jackson Boulevard, Chicago, Ill., has perfected and is placing on the market a new lamp hanger and cut-out which embodies several features unique in the construction of such devices.

One of the essential features of the Acco hanger, which is illustrated herewith, is the means of making the circuit contact. As may be seen in Fig. 1 the upper plate of the hanger is provided with two terminals with suitable holes bored in same to admit the contact plug. A unique feature of the contact-making device is the fact that the upper or female contact has a flange at the bottom, concaved so as to guide the male contact when brought together. This insures correct electrical contacts when the hanger is locked under all

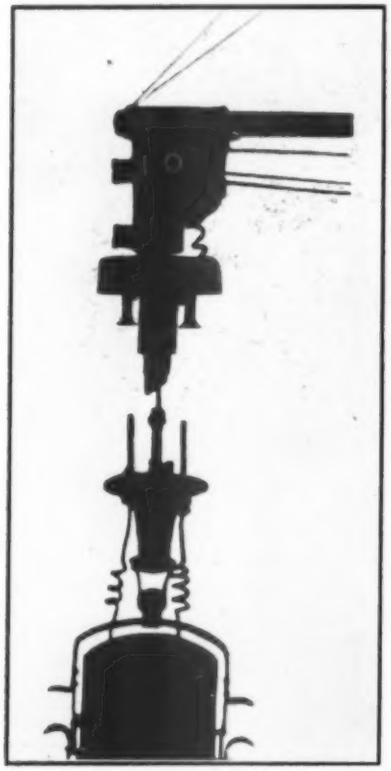


FIG. 1.—HANGER DISCONNECTED WITH COVER REMOVED.

conditions of wind and twisting while the lamp is being raised.

The locking device, which it is said is a marked improvement over the toggle-locking device commonly used on hangers, consists of a center tube having two apertures acting as bearings for four balls which are held in position by a sliding retaining shield. This shield has a specially constructed pocket to allow the balls to drop out of bearing, thus permitting the plunger, shown between the two terminals in Fig. 1 to enter the center tube.

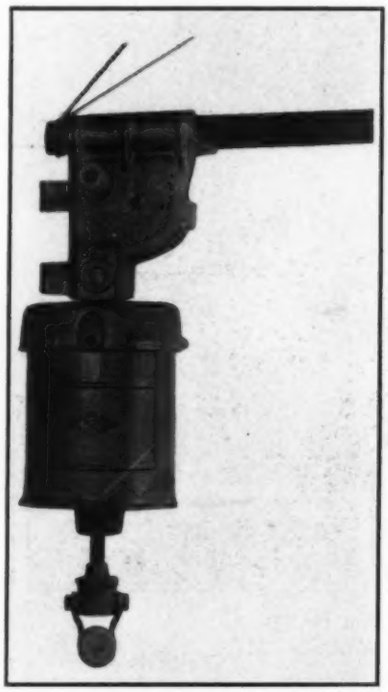


FIG. 2.—ACCO ARC LAMP HANGER COMPLETE.

The operation of the Acco hanger is as follows: The plunger, which has a tapered head, upon being pulled up into the center tube forces the two lower balls into a pocket located in the sliding retaining shield. As the head is pulled further up into the tube, the two lower balls drop back into the bearing and thereby lock the plunger when it is released from any lifting power. The plunger is released by again applying the lifting power and lifting the plunger which in turn lifts the sliding retaining shield until the two upper balls drop into the pockets. As the plunger is lowered the upper two balls come in contact with the lower two balls in such a way as to prevent them from dropping back into place.

It has been found in many of the existing types of arc-lamp hangers that, owing to their construction water is permitted to leak in on the lifting cable. In cold weather when the hanger is installed outdoors this leads to much inconvenience due to the water freezing. In the Acco hanger this defect has been overcome by a device so constructed and placed that when the lifting cable comes in contact with it, at the entrance to the pulley, any water running along the lifting cable is thrown off.

Fig. 1 is a view of the hanger with the contacts disconnected and the cover removed. It is apparent that the Acco arc-lamp hanger is an absolute cut-out as the current must necessarily pass through the contact members. This feature insures of safe working conditions regardless of where the lamp is hung.

In Fig. 2 is shown the hanger complete. As may be seen its design is symmetrical in every respect. The manufacturers state that all parts entering into its construction are of the best quality obtainable. The working castings are of steel and the entire device is very durable.

When the cut-out is closed, as shown in Fig. 3, the weight of the lamp is on

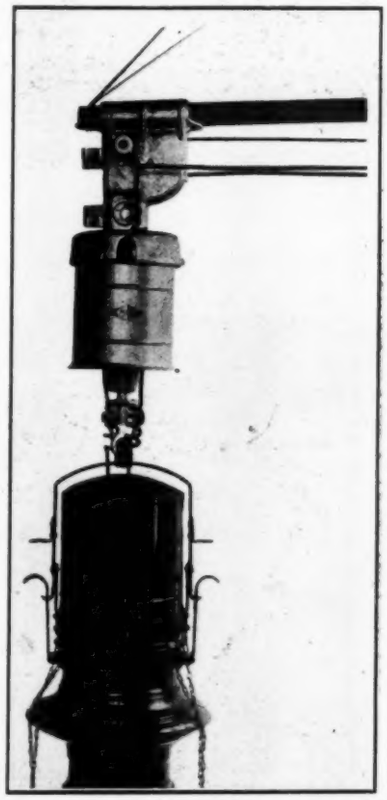


FIG. 3.—HANGER COMPLETE AS IT APPEARS IN SERVICE.

the main upper casting, not on parts that may become loose or worn.

It is reported that the Westinghouse Electric & Manufacturing Company has bought seventy acres of ground at Trafford City, Pa., and will soon let contracts for a mammoth industrial plant at that site.

Pennsylvania Railroad Lays Submarine Cables.

The problem of satisfactorily caring for the numerous telephone, telegraph and signal wires necessary for the operation of a large and important railroad at points where its tracks cross a navigable river, making a drawbridge a necessity, has recently been solved by the Pennsylvania Railroad Company at its new Hackensack "draw" at the point where the Pennsylvania Terminal and Tunnel Division crosses the Hackensack River, a few miles west of Jersey City.

The accompanying illustrations show the laying of two submarine cables, one of thirty-five pair No. 13 gauge, triple-wrapped paper insulation, to be used for telegraph circuits, and the other of forty-five pair No. 13 gauge, double-wrapped paper insulation, having the wires of the inner core triple wrapped, and having eight pairs of this core twisted into double wires, thus forming four phantom circuits. Each cable was 1,225 feet long, the thirty-five-pair cable weighing eleven and a half, and the forty-five-pair twelve and a half tons. Each cable had a lead sheath five-thirty-two inches thick. Each sheath was saturated with a noncorrosive preservative compound, over which was wound two layers of saturated jute put on in reverse directions. Over this jute was placed an armor of iron wire, the armor being saturated with a preservative compound, and over this was placed two thicknesses of hemp rope, laid on in reverse directions and thoroughly saturated with preservative compound. The average mutual electrostatic capacity of this cable was between .06 and .074 microfarad per mile.

These cables were made by the Western Electric Company, at the Hawthorne, Ill., factory.

The work of laying these cables was done by the Postal-Telegraph Cable Company, and was under the personal supervision of M. Keily, who represented J. C. Johnson, superintendent of telegraph of the Pennsylvania Railroad.

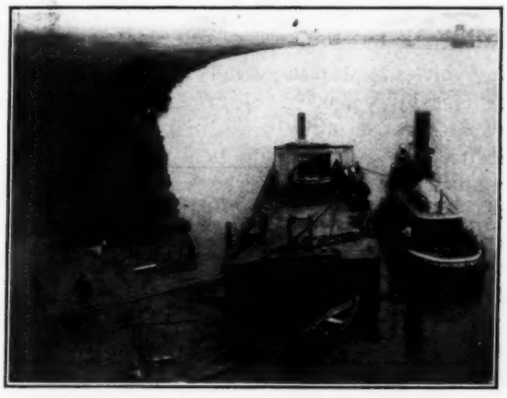
One very interesting feature aside from the laying of the cable was the very efficient and durable line of concrete poles which terminated on either shore. These poles were cast by the railroad company in accordance with its own specifications, and it is expected that they will be found much more suitable in the low, swampy ground where they are placed than wooden poles.

The weight of this cable was such that it was not necessary to do any dredging along the river bottom, as it is expected that the weight of the cable will enable it to sink far enough into the mud to prevent its receiving any injury.

The engineers of the Pennsylvania Railroad Company, who worked in conjunction with those of the Western Electric Company, were kept busy for some time designing and developing this cable, which is the very latest product for submarine work.

NEW OZONE GENERATOR FOR BEDROOM.

TERMINAL BOX AND CONCRETE POLES IN BACKGROUND.



UNREELING CABLES FROM SCOW.

Ozone Generator for the Bedroom.

An important aid in the treatment of disease is the ridding of the sickroom of impure air and obnoxious bacteria. This also applies to the poorly ventilated workroom or the office, for it is now generally known that the good health and vitality of the occupants depends upon the air they breathe.

An interesting application of electrical energy to this end is the production of ozone by high-tension discharges. Such apparatus is now constructed for purifying air and water, and, with the increasing understanding of the beneficial results obtained smaller appliances are now offered specially designed for bedroom and sickroom purposes.

In this connection attention is called to the ozonizer illustrated herewith, which comprises a small step-up transformer, delivering at the discharge electrodes a potential of about 6,000 volts. The silent discharge occurs between banks of small points and plates contained in the lower box section, one side of which has been cut away to show its interior. The arrangement of the gap and the character of the discharge is such that a large proportion of ozone is generated.

The manufacturers, the Ozone Pure Airifier Company, 304-311 Rand McNally Building, Chicago, are placing on the market ozonizers of every size for all purposes, including the ozonizing of water.

General Electric Company Awarded Contract.

The General Electric Company was recently awarded the contract for furnishing electrical machinery to the Brooklyn and Mare Island Navy Yards. The contract price was $12,092. F.

Government Contracts Awarded.

A number of Federal Government contracts have recently been awarded to various companies for electrical supplies. Among these the following might be noted:

The Standard Underground Cable Company has been awarded a contract for supplying the Brooklyn, Puget Sound & Mare Island Navy Yards with single conductor, the total value of the contract being $22,641.23. At the same time the General Electric Company has secured the contract to supply the same yard with twin conductor at a total of $15,206.50; the same Company has also secured the contract to supply the Brooklyn yard with 80,000 feet of double conductor for which they will be paid $10,528. The Standard Underground Cable Company has also secured a contract to supply 5,000 feet of copper conductor and 3,000 feet of telephone cable at Iowa Island at the price of $1,667.

One turbo generating set for the Charleston Yard will be supplied by the General Electric Company at $900.25; forty-eight combination running lights for the Brooklyn Bureau of Steam Engineering; by the Porter Company at $2,038.56; 800 arc-lamp globes by the National Electric Supply Company, of Washington, D. C., at $213.

F.

Electric Vehicles for Hauling Coal.

Coal haulage by means of electric vehicles represents negotiating with dead weights and demands absolute efficiency on the part of the vehicle used. In New York City several of the large dealers have entirely replaced their horse-drawn vehicles with electrics with excellent results.

Among New York companies engaged in the coal business, the Curtis-Blaisdell Company has made a creditable record with the General Vehicle truck now in service. The first month of this company's experience showed a delivery of 869 tons throughout New York, covering a radius of 5,127 city blocks in the actual running time of 154.5 hours. The average monthly figures since then show still greater efficiency, as follows: Total working days, twenty-six; coal delivered (tons), 963; cyclometer reading (miles), 721; daily tonnage, twenty-seven; daily mileage, twenty-eight; average trip of the vehicle (miles), 3.7.

Lighting Installation on Transatlantic Airship.

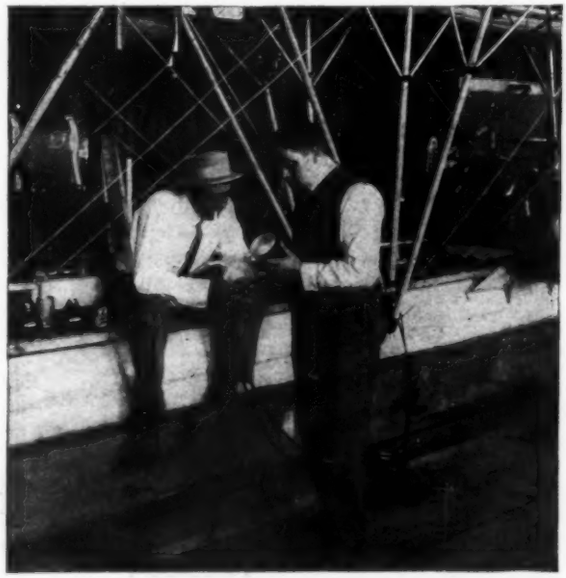
About the most unique lighting installation is that on the airship *America*, in which it is claimed Walter Wellman will attempt to cross the Atlantic Ocean in the near future.

The lighting was designed by representatives of the Buckeye Electric Company and the Holophane Company, who not only laid out the lighting scheme but who practically installed the entire electrical equipment with exception of the wireless outfit which the ship carries. In view of the fact that the frame or nacelle of the airship is used as the aerial of the wireless outfit, this matter of providing safe and adequately insulated circuits was a serious task.

Eight Buckeye-Holophane units constitute the airship's equipment, twenty-volt, twenty-five-watt Mazda lamps being used with SI-25 intensive type steel reflectors. These illuminate the three gasoline engines which the ship carries, the cabins in which records are made and observations taken, and the wireless cabin. While the lighting problems involved were not many nor difficult of solution, the installation called for the exercise of considerable ingenuity upon the part of the engineers in charge. The Holophane reflectors employed are of a type which completely hide the lamps, and they are so located as to entirely eliminate glare effect. This is essential, as the operators of the machines and instruments must at all times have clear vision to keep a sharp lookout for passing ships or when approaching land, and the blinding effect of bare lamps or flat shades might prove disastrous in an emergency.

In the selection of the lamps, also an unusual policy was followed, that of selecting lamps some four volts below the line voltage, so that higher efficiency and candlepower would be secured. The question of the life of the lamp in such a service is not important, but the Buckeye lamps selected will stand the overload imposed upon them for a considerably longer time than their service on this passage will require.

The installation is a somewhat spectacular example of both Buckeye and Holophane progressiveness. Both companies have wide reputations for being to the fore in all matters of illumination, and the equipment of the *America* emphasizes this trait. When the lighting of airships becomes standardized, the same as the lighting of railway cars, this installation on the first electrically lighted airship will be something to boast of.



AIRSHIP EQUIPPED FOR ELECTRIC LIGHTING.

Turkish Contract Awarded.

According to cable advices the Turkish government has awarded the concession for furnishing electric light and power to Constantinople to the firm of Ganz and Company, of Budapest, Hungary. Many Americans were seeking the contract.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, SEPTEMBER 24.—The annual conference of the Municipal Tramways Association, which concludes at Bradford today, has brought out one or two interesting points of view which must be regarded as likely to have an important bearing on the future of tramways in Great Britain. Quite a remarkable feature of the meeting was the almost unanimity of opinion that tramway undertakings worked by municipalities must be regarded as business concerns, and that no money should be paid away in relief of rates until substantial provision has been made for reserve. This is a point of view which most tramway managers have been trying to bring home to their committees for many years, but the political advantage of paying sums in relief of rates from their tramway and electricity profits has hitherto warped the minds of a good many chairmen and councillors, and managers have seen comparatively large sums of money paid back to the local treasurer, well knowing that their undertakings needed it most.

In spite of the fact that the trackless-trolley system seems to be making headway slowly here, yet quite a considerable number of tramway managers and chairmen of committees are in favor of it. It is true that only two towns, Bradford and Leeds, have the necessary Parliamentary powers to adopt the system, and probably others are wanting to reap the benefit of their experiences. Only one voice was heard at the Bradford conference in condemnation of this system of traction for developing new districts, and it may be taken that many miles of this form of traction will be in existence within the next five years.

Two other matters discussed at the Bradford conference deserve a reference. A few towns have developed the carrying of parcels of goods on their tramways to quite a successful venture, but in spite of this, many more towns have the necessary Parliamentary powers but hesitate to put them into effect. This has been reflected in the attitude of Parliament towards corporations now seeking similar powers, and last year one important corporation was refused an extension of its powers. The view is gaining ground, however, that our tramway facilities are very poorly utilized, and that the carriage of passengers does not constitute the only function. This policy is being given effect to in Leeds, where contracts have been entered into for the carriage of goods, as distinct from parcels. More than one company is doing the same, and at Dublin the carriage of parcels alone constitutes a considerable item of revenue. The Bradford conference has brought the matter into greater prominence and developments will undoubtedly follow.

Finally, quite a new aspect has been put upon the future of tramways here in relation to the Town Planning Act of last year, which enables local authorities to schedule land which is ripe for building purposes and purchase it with a view to its proper laying out. It is now suggested that this should be put into force in such a way as to develop outside districts, not outwards from the big town to the suburb, but from the suburb to the town. It is argued that by this means agricultural land can be purchased at about $500 per acre instead of from $2,500 to $5,000 per acre when no town planning scheme is contemplated, and in conjunction with the scheme roads ninety feet in width and upwards could be constructed, having a tramway track separated from that portion used by ordinary vehicular traffic. If the tramway track can be relieved of the wear and tear of the ordinary traffic—and consequently a considerable sum in maintenance and repair—then a very much cheaper form of construction can be adopted in the way of paving alone. The saving on this head is estimated as high as $11,500 per mile.

Experiments are being carried out on quite a considerable number of tramway undertakings here with speed indicators and current meters. The results are being recorded by the tramway associations and will be published in due course.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, SEPTEMBER 23.—There is a project on foot for erecting a garbage-consuming plant in connection with an electric station in the suburbs of Rouen, France, and it is to be built and operated as a municipal plant. The steam which is produced in the boilers will be utilized for operating two steam-turbine and alternator groups, and the current will serve for a municipal water pumping plant which it is intended to erect upon the premises, as well as for various motors and for the lighting of the premises.

On the Rhätische railroad system in Switzerland it is intended to use electric traction upon several different sections, these being the Bevers-St. Moritz, Samaden-Pontresina and the Bevers-Schuls sections. This latter part of the line is now in construction. Single-phase current will be employed in this case, and the railroad administration has already made a contract with the Brusio hydraulic plant for the supply for the space of ten years. The current will be delivered at 10,000 volts.

In the Indre and Loire department of France, the Council is engaged upon a project for extending the telephone lines so as to take in a number of communes. Petitions asking for the telephone service have already been addressed to the council by different communes, and the council is now engaged in classifying these and drawing up a list of such localities. The first list which includes Chambourg, La Croix and others, in all fifteen communes, will be proceeded with in the first place, followed by a second list containing thirty-three communes. The project as a whole is an extensive one and will involve a considerable amount of construction work.

A new electric railroad was opened up not long since in Switzerland in the region of the Rhone Valley and Mont Blanc. It is a standard-gauge line, and runs from Martigny, an industrial center in the Rhone Valley and lying on the Swiss Federal railroad, and the locality of Orsieres, which is the terminus of the electric line. The road starts from the town of Martigny and runs along the valley of the Dranse, mounting to an altitude of almost 2,700 feet above sea level at the terminus. Near the starting point of the road is a large electrochemical works which uses power from the Dranse River, and it is proposed to run a branch line in order to connect the electric road with another plant in this region, which is operated by the British Aluminium Company.

In Austria there is a project on foot for building an electric railroad from the town of Attersee to Vöcklamarkt, and the firm of Stern and Hafferl has obtained the rights from the railroad administration. I also note the construction of an electric plant in the town of Mittel-Langenau by a local company. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA ONT., OCTOBER 1.—The opening ceremonies for the turning on of the Niagara power for the Ontario Hydro-Electric Commission will be held at Berlin, Ont., on October 11. Among the numerous guests invited is Thomas A. Edison.

The Hydro-Electric Commission has decided to make application to the interests that control the power production, the Trent Valley, for power to be served to Coburg, Whitby and other towns in the Midland district of Ontario. With this extension the work of the Commission will cover the whole province—the Ottawa Valley, St. Lawrence frontier, Midland district, Niagara power zone, Fort William and Port Arthur.

Messrs. Ross & Holgate, of Montreal, have been engaged by the City Council of Sherbrooke, Que., to prepare plans for a large power station at the point on the Magog River known as the Drop Off Power. This power is situated just at the outlet of Little Lake, and when development is accomplished will give the city an additional supply of 2,500 horsepower.

Additional cities and towns, in the eastern part of the province of Ontario, have asked the Hydro-Electric Power Commission for estimates on power. Kingston wants 2,500 horsepower; Brockville, 1,000; Belleville, 3,200; Deseronto, 300; Oshawa, 500; Coburg, 900; Bowmanville, 600; Picton, 500; Durham, 2,000. The Commission has communicated with the power companies, requesting them to quote prices.

The Seymour Power & Electric Company wants a franchise to sell its power in the city of Kingston, Ont. The company proposes that the city shall supply all customers using less than twenty-five horsepower, the Company to supply all those who take more than that amount. There will be opposition, however, to giving any franchise at all to the Company. Members of the council favor receiving power from the Company at the city's switchboards, the city to do all the distributing.

It is reported on good authority that, in the near future, construction work for developing power in the south Sault channel of the St. Lawrence, Long Sault Island and the mainland, which is entirely in American territory, will be commenced by the Long Sault Development Company. It is also reported that the Ontario & St. Lawrence Power Company intends developing power at Waddington, also entirely in the territory of the United States. If such works go on, it is said that the Canadian Government will likely cause thorough investigation to be made to see that the flow and levels of the river on the Canadian side are not materially affected.

Varied comments are heard in financial circles regarding the

terms of the proposed merger of the Montreal Street Railway and Montreal Light, Heat & Power Companies, as set forth in the circular issued by the street-railway directorate. This gives the relative figures upon which the two concerns are to be combined into a holding company as $250 per share for street railway stock and $190 for power stock. The presumed capital of the merged companies is placed at $57,300,000, supposing that all the shares of the two concerns were transferred to the holding company. The net income of the Street Railway Company, for the year 1909, is placed at $1,229,357, while that of the Light, Heat & Power Company, for the same year, amounts to $1,911,200, or a total combined net income of $3,140,557. Applying the total net income of the two companies to the capitalization, the net income per cent would be, according to the circular, 5.48 per cent, so it does not appear that the new company, if brought into being, could be started on more than a four-per-cent basis.

MEXICO.

(Special Correspondence.)

MEXICO CITY, MEX., OCTOBER 1.—The installation of two new units as an enlargement of the great hydroelectric plant of the Mexican Light and Power Company at Necaxa will soon be finished. The hydraulic works that were necessary in order to provide an adequate water supply for operating the enlarged power plant have already been finished. Each of the two generators that are now being installed has a normal rated capacity of 12,500 kilovolt-amperes, or 16,750 horsepower, at 4,400 volts, three-phase, sixty cycles. They will operate at a normal speed of 300 revolutions per minute. Each generator has a maximum capacity of 15,000 kilovolt-amperes.

The Compania Minera Santa Ana y Anexas, of Pachuca, has finished the installation of a complete electrical equipment in its mines and mill and is obtaining power from the Compania Electrica e Irrigadora, which is now a subsidiary concern of the Mexican Light and Power Company. The hoists and air compressors are operated by electricity and the power is used to advantage in many ways. The cost of mining operations is considerably reduced under the new method, it is claimed.

The Compania Minera Augustias y Anexas has finished the installation of an electric power plant at its mines near Pozos, State of Guanajuato. The pumps and other machinery of the mines are operated by power from the new plant.

The Compania Minera Santa Ines Carretera has installed a complete electrical equipment at its mines near Pachuca, and is using power furnished by the Compania Electrica e Irrigadora. The Company has also installed an electric hoist.

The Guanajuato Power and Electric Company, of Guanajuato, will soon have its new power transmission line finished to San Luis Potosi, where it has contracted to provide lights and power for the large smelter of the American Smelting and Refining Company and other important industrial plants. The company recently finished its transmission line to the San Felipe mining district, where it will furnish power for operating the machinery of the Providencia San Juan de la Luz and other mines.

El Tajo Mining Company has finished the installation of a sectionized power plant upon its property near San Sebastian, to provide its new mill and mining machinery with power. The plant is hydroelectric. It was necessary for the machinery to be built in sections so that it could be transported on burro back over the mountains and along trails to the site of the plant. D.

COMMISSION NEWS FROM NEW YORK.

(Special Correspondence.)

The Buffalo Gas Company has filed with the Public Service Commission a complaint against the City of Buffalo, alleging that the city is indebted to it for a sum of more than $124,000. This is of interest as being the first complaint received by the Commission under the amendment of the Public Service Commission Law made last year, which provides that gas or electrical corporations can make complaints as well as municipal authorities or individuals.

The Public Service Commission, Second District, has received an application from the Postal Telegraph-Cable Company for an order restraining the Western Union Telegraph Company from discriminating against competitors in the matter of rates. Complaint alleges that in places in the state of New York where there is no office of the Postal Telegraph Company, it is obliged to hand its messages over to the Western Union Telegraph Company for delivery. The Postal Telegraph Company collects from the sender the same fee as is charged by the Western Union between the sending and receiving point, and delivers it to the Western Union at the nearest office to the receiving point possible. The Western Union Telegraph Company not only charges the local fee from the point it receives the message to destination, but also adds a charge for four or five words indicating that the message had been turned over to the Western Union for further transmission, the additional words giving the place where and the date when the message was actually turned over to the Western Union.

The Western Union Telegraph Company makes a charge of from two to three cents per word in excess of ten, according to the rate, in addition to the full local rate. The Postal Company claims that as a result of such discrimination and unreasonable charge, it is obliged to pay to the Western Union a greater sum than it receives from the sender of the message so transferred.

The complaint further alleges that the Western Union Telegraph Company, although it has submarine cables from Europe to New York City in competition with other cable companies, accepts at New York for transmission at different points in New York State telegraph and cable messages from points in Europe to points in New York State and does not charge competing telegraph and cable companies for additional words indicating that said telegrams or cablegrams were turned over to the Western Union Telegraph Company.

The Postal Telegraph Company claims that it is obliged to accept from the public all messages which are presented to its various offices, whether destination is located on its lines or not.

The Commission is asked to make an order permanently restraining the Western Union Telegraph Company from charging any sum or sums of money on account of the adding of additional words referred to in the complaint.

COMMISSION NEWS FROM NEW JERSEY.

(Special Correspondence.)

The Board of Public Utility Commissioners has approved of the proposed issuance, sale and delivery by the New Jersey & Hudson River Railway and Ferry Company of $100,000 of four-per-cent mortgage bonds. The proceeds from the sale of these bonds are to be used for the extension and construction of tracks and additions to the power house.

The Board has also approved an ordinance adopted by the Newark Board of Street and Water Commissioners granting permission to the Public Service Railway Company to construct and operate street-railway connections between its tracks in Bridge Street, Front Street and Ogden Street, Newark, it being found that the permission sought is necessary and proper for the public convenience.

For the purpose of discussing the subject of a uniform system of accounting for electric-light companies a conference was called by the New Jersey Board of Public Utility Commissioners at Trenton, N. J., September 22.

Commissioner Thomas J. Hillery, who called the meeting to order, remarked that such a preliminary meeting seemed advisable, in order that the Commission might receive advice and suggestions on the subject.

In starting the discussion, Philander Betts, chief inspector of the utilities division, called attention to the importance of uniform accounting and mentioned the work done by the National Electric Light Association in this respect. He recommended the adoption of the system of accounting devised by that body.

E. J. Allegaert, who was a member of the committee which recommended the National Electric Light Association classification, thought that while the system was not yet perfected, it would ultimately come into use. He further suggested that the system might be prepared for adoption by January 1, 1912.

Speaking from the standpoint of a holding company, Frank J. Pryor said that New Jersey was the first state in which his company, the American Railways Company, owned properties where a uniform system of accounting had been suggested. In closing he recommended the adoption of the National Electric Light Association classification.

Thomas W. Haldeman, vice-president of the Washington Electric Company, thought that the classification might be too elaborate for towns of 4,000. It might, he suggested, be satisfactory with some simplifications. To this Mr. Hillery replied by saying that it was not the intention of the Commission to unnecessarily burden the smaller companies with complications.

The committee, according to Mr. Allegaert, had not gone far enough to prepare systems for very small companies, but for these the eight general operating expense accounts could be used. A detailed system could be prepared by the companies themselves, acting with the Commission.

Mr. Betts spoke in favor of having the different schemes analyzed with a view to making recommendations. Provisions should be made for different grades of companies, as has been done by the Street and Interurban Railway Accountant's Association. Furthermore, accounts for a power plant should be kept under one heading in cases where the company does both a lighting and street railway business.

Although the complete system of accounting will be a matter of growth, Mr. Hillery recommended the appointment of a joint committee to consider the accounting forms.

Mr. Betts remarked that each company should make a full appraisal of its property. That such a step should be taken was also the recommendation of the Public Policy Committee of the National Electric Light Association, in view of the decision of the United States Supreme Court in the Knoxville and Consolidated Gas cases.

Messrs. Allegaert, Young and Case spoke briefly about costs and accounts.

In conclusion Mr. Hillery stated that it was the desire of the Commission to act with the lighting and power companies of the state in settling the question of accounting.

LIGHTING AND POWER.

(Special Correspondence.)

CHISHOLM, MINN.—The installation of a municipal electric light plant is being agitated. C.

CHARITON, IOWA.—This city proposes to lease its electric light plant for a period of twenty-five years. P.

CLOQUET, MINN.—Machinery is being installed in the light and power plant of the Cloquet Electric Company. C.

MARSHFIELD, WIS.—The Marshfield Brewing Company is installing electric motors for operating its machinery.

RICHMOND, CAL.—The Great Western Power Company has applied for a franchise to supply this city with power.

ELMA, WASH.—The Chehalis Fir Door Company is about to erect a plant, and will install its own electric light plant. P.

ALHAMBRA, CAL.—At a recent meeting of the taxpayers here it was voted to bond the city for $23,000 to build a light plant.

KANSAS, ILL.—The Central Illinois Public Service Company, of Mattoon, will assume charge of the municipal lighting plant here. Z.

SAGINAW, MICH.—The Whipple Electric Company has been incorporated with a capital of $10,000 to supply electric light and power.

ELDORA, IOWA.—Construction will shortly be started by the Park Dam Company on a concrete dam and power house to cost $10,000. C.

BIRMINGHAM, ALA.—By a vote of sixty-six to one the citizens of this place voted not to sell the North Birmingham water and light plants.

BODE, IOWA.—The Bode Heat, Light & Power Company, capital $10,000, has been incorporated by L. L. Kinseth, N. A. Nasby and others. C.

WALTHILL, NEB.—This town is soon to have a municipal electric light plant. Frank H. Wheeler of Havelock has the contract for its installation.

LOCKNEY, TEX.—Local capitalists are installing an electric light plant here. Work is being pushed and the plant will be in operation in a short time.

FLORESVILLE, TEX.—Outside parties desire to install an electric light plant here, and have communicated with the Business Men's Club to that effect.

NORTH WALES, PA.—The Gas Company is negotiating for the purchase of the electric lighting plant of this place. The sum of $50,000 has already been offered.

BOWLING GREEN, KY.—The Isbell-Chapman Electrical Company has been incorporated with a capital of $5,000 by Wm. H. Isbell, W. W. Chapman and G. L. Mercer.

BENSON, ARIZ.—Within a few weeks J. E . Collins of Tucson, Ariz., will erect an electric lighting plant here. A sixty-kilowatt machine and two engines will be installed.

ST. CHARLES, MICH.—At a special election it was decided to bond the city for a municipal lighting plant to cost $14,000. Work will be begun as soon as the bonds are sold.

MARYSVILLE, PA.—The Marysville plant will soon be done and will furnish current for lighting this town. It is expected that the lights will be turned on sometime in October.

LAKEPORT, CAL.—W. A. Hoback, of Oakland, Cal., has applied for a franchise for an electric lighting plant here. S. M. Gardiner, also of Oakland, will finance the deal.

DECORAH, IA.—The Upper Iowa Power Company has ordered a new 800-horsepower water turbine which will be installed this fall. The Company has also bought a new electric generator.

AURORA, MINN.—The contract for the standards to be used in the installation of the curb lighting has been let by the city council to the Thompson & Stewart Company, a Duluth, Minn., firm. C.

MONTICELLO, IA.—Monticello now has a new power house which can supply day power as well as night power, which the city has never had before. Work will soon be started on the new flume.

STOUGHTON, WIS.—The city of Stoughton is considering the purchase of the Yahara River water power, now owned by the Stoughton Milling Company. The property is valued at about $17,000.

HOOPESTON, ILL.—The Hoopeston Retail Merchants and Business Men's Association has decided to install twenty-four ornamental light posts and the city has agreed to furnish power for the same. Z.

ELMA, WASH.—The Olympic Railway & Power Company has been incorporated by M. H. Lynch, D. E. Servis and others, with a capital of $3,000,000, to furnish manufacturing plants with electric power. C.

LA GRANGE, IND.—The Riverside Electric Company, which will furnish electric power for lighting, has been incorporated with a capital of $10,000. The incorporators are J. C. Cain, W. H. Cain and A. L. Cain.

DENVER, COLO.—It is announced that the $1,000,000 in coupon notes authorized at the recent meeting of the Denver Gas & Electric Company will be used in paying for the improvements to the Denver plant.

PERU, ILL.—Contracts have been awarded to an Aurora firm for fifty-seven ornamental street-lighting posts, which are soon to be installed. The posts are to be placed on the main business street of the town.

WAILUKU, H. I.—The Wailuku Electric Company is ready to start work on an electric lighting plant. It was intended when the Company received its charter to build a power plant as well, but this will be built later. A.

CHISHOLM, MINN.—The new 400-horsepower Corliss engine of the Range Power Company, recently arrived and a force of engineers and workmen is engaged in preparing the foundations for the new improvements.

YORK, PA.—The ordinance granting permission to the North York Electric Light Company to erect and operate electric light lines in the borough of North York passed both readings at a recent meeting of the council.

DREXEL, MO.—A. J. Harbison is preparing to install an electric lighting plant at Drexel, and while his object is to light his own property, he will build a sufficient plant to furnish light throughout the business section.

INDIANAPOLIS, IND.—The People's Heat and Light Company is planning to expend $9,000 for new boilers and other machinery, including a new 150-foot smokestack in its plant on the corner of Alabama and Sixteenth Street. S.

CARLYLE, ILL.—The Carlyle City Council has awarded the contract for supplying a 225-horsepower engine, two new boilers and a new dynamo for the municipal lighting plant to the Russel Manufacturing Company of Massillon, O. Z.

FARGO, N. D.—At a recent meeting of the City Council it was decided to extend the system of ornamental street lighting into the business district of the city. All lights are to be uniform and there will be six or eight lights to the block.

NEW EGYPT, N. J.—The New Egypt Electric Light, Heat, Power and Water Company has recently completed its new power house. The two forty-horsepower oil engines are in position, and the Company expects to be in operation by October 15.

OKLAHOMA CITY, OKLA.—The Home Heating and Lighting Company has been incorporated with a capital of $100,000. Directors are: E. J. Deu Pree, J. D. Deu Pree, W. T. Croslen and W. E. Hudson of Oklahoma City, R. J. Morgan of Altus.

ALBERTVILLE, ALA.—The City has extended the franchise of the local lighting plant until January 1, 1911. The stockholders of the Sand Mountain Electric Company intend to buy some new machinery and will put the plant in better shape.

ALEXANDRIA, MINN.—The contract for the installation of a second unit at the electric plant, including an eighty-five-horsepower engine and fifty-kilowatt, direct-connected generator, has been awarded by the city council to A. L. Ide & Sons. C.

MT. CARMEL, ILL.—Superintendent A. R. Manley, of the Mt. Carmel Gas & Electric Company, now insolvent, has asked the United States court for permission to issue receiver certificates for $20,000 to make improvements to the plant in this city. Z.

ELBERTON, GA.—The "Great White Way" proposition is flourishing in Georgia, and Elberton is the latest recruit to the popular plan, Oliver Street merchants having perfected plans for electrically illuminating the street through the business section. L.

UPLAND, CAL.—The Pacific Light and Power Company has been granted a franchise to erect poles and string wires along Orange Avenue and to connect with the Tenth Street line. The company is planning to build a power house on Orange avenue.

WAUSAU, WIS.—At the meeting of the council the ornamental street lighting system was adopted. A total of 100 standards will be put in to begin, eight in each block on the main business streets, and later the sytem is to be extended to the residence sections.

GRAND FORKS, N. D.—H. M. Byllesby & Company, owners of the light and power plants at Fargo, Grand Forks and many other places in the valley are negotiating for the purchase of the A. B. Keerlin plant at Devils Lake and the L. M. Davis plant at Minot.

SEATTLE, WASH.—An ordinance has been passed adopting a plan for enlarging and extending the municipal lighting plant, the cost of which is estimated at $1,400,000. A special election will be held here on November 8 to decide in favor of or against the improvement.

BAKERSFIELD, CAL.—General Manager W. F. Boggs of the Kern River Oil Fields, Ltd., has confirmed the report that his company has contracted with the San Joaquin Light & Power Company to furnish 2,500 horsepower to the oil fields of the Kern River Company.

BOISE, IDAHO.—Articles of incorporation have been filed in the office of the Secretary of State by the Boise River Light & Power Company of Boise; capital stock, $25,000. The incorporators are M. V. Landers, Robert Noble, M. A. Regan, P. J. Smith and John J. Blake.

CHARLESTON, S. C.—The Charleston Railway and Lighting Company will start work on its new power house at once, and will finish it in about a year. Machinery equipment for the present will consist of one 1,000-kilowatt turbine generating set and two 2,000-kilowatt sets.

LA GRANDE, ORE.—The Eastern Oregon Light & Power Company representing a consolidation of the Baker City Light & Power Company, the Fremont Company, and the Grande Ronde Company is about to make a twenty-mile extension of the Imbler and Elgin lines.

VILLA GROVE, ILL.—C. W. Hagerman, manager of the Electric Light Company of this village, has closed a contract with Broadlands people to extend his Villa Grove-Longview electric light line, now in progress of building, to Broadlands, a distance of twelve miles from this place.

GEORGETOWN, CAL.—A large number of men with teams are at work on the dam of the Loon Lake Water & Power Company, and construction is being rushed. At the Rubicon Water & Power Company's plant on the middle fork of the American River, near this city, work is also progressing rapidly.

DANVERS, MASS.—The town of Danvers is spending $12,000 for improvements on its electric plant. It is having a new engine set up, and it will introduce new apparatus into its plant. The plant seems to be a success in municipal enterprise and furnishes electricity at a very low rate for lighting and power.

ST. CHARLES, ILL.—The following committee has been named by the St. Charles Business Men's Association to canvass the situation with a view of installing a decorative light system: W. P. Lillibridge, H. G. Hempstead, Frank Rockwell, C. H. Haines and E. A. Goodell. A system costing $4,700 to $5,000 is contemplated. Z.

MICHIGAN CITY, IND.—Electrical milkers are being installed in the milking sheds of the Hotchkiss and Field Dairy Farm near this city. The farm of 2,000 acres is pierced by the South Shore Electric Railroad and the electric current to operate the milkers and other dairy machinery will be secured from the lines of the electric road. S.

DUNKIRK, IND.—A shipment of copper wire valued at $10,000 has been received at this point, where it will be strung by the Muncie Electric Light Company in order to give this town and Redkey an electric light system, the current to be furnished by the big power plant of the Muncie Electric Light Company, located at Muncie. S.

JERSEY CITY, N. J.—From private plans the Texas Company, of 17 Battery Place, Manhattan, will shortly start the erection of a power plant at their works in Bayonne. The new building will be of reinforced concrete construction, five stories in height and will measure 50 by 100. The cost of the plant will be about $50,000.

MARSHALLTOWN, IOWA.—In a report to the City Council A. L. Bogart, engineer representing the Power Engineering Company, of Minneapolis, has advised that the municipality secure power from the Iowa River and says that fifty horsepower could be developed at all times of the year and that 150 horsepower is possible. Z.

BAY CITY, MICH.—The Tittabawassee Power Company, which has been recently organized to furnish power to light Bay City, Saginaw and other towns, has let a contract to build a dam near Sanford to develop 1,800 kilowatts, a capacity two or three times greater than the city plant at Bay City. More dams will be built as needed.

DE PASS, WYO.—The destruction by fire of the new power plant of the Williams-Luhman Mining Company near this place will result in an indefinite shutdown of the property. The loss is $20,000 and no insurance was carried on the destroyed property. The plant is to be replaced as soon as the necessary arrangements can be made.

ROCKFORD, ILL.—Extensive additions and improvements are being made to the plant of the Rockford Electric Company, among them being the installation of a 4,000-kilowatt turbine generator. Two additional 500-horsepower boilers are also being installed. At present about eight per cent of the total power is generated by the hydraulic installation.

MANCHESTER, IOWA.—The franchises of the Manchester Heat, Light and Power Company and E. W. Hoag, supplying current in the city, having expired, renewal for twenty-five years by each is sought. In order that both will have an equal chance it is asked that the special election on both propositions be held upon the same date. Z.

PRESCOTT, ARIZ.—Within a few months a new power line will be installed between here and Jerome, supplying power to that district from the Prescott Gas & Electric Company. There is now a line in operation between these points and the additional line is to supply greater power and act as a substitute in case of damage to the line now in use.

SALINAS, CAL.—John M. Gardiner, vice-president of the Monterey Electric Light & Power Company, who has been acting as chief executive since the death of President George Hazelton, announces that his company will soon begin the $500,000 improvements planned for this county with the expectation of finishing the work within ten months.

ST. LOUIS, MO.—The franchise of the West End Light & Power Company was, as the result of a recent suit, held to be valid. This victory is the second one the West End Company has won in the Circuit Court. The first was when Judge Grimm decided more than a year ago that the charter had not been forfeited for nonuse and was still valid.

DUNDEE, ILL.—The new power station for the Star Manufacturing Company is nearing completion. Excavations are nearly completed and much of the heavy machinery has been installed. Within a short time it is expected that everything will be in readiness to start. Current will be generated by water power and fed to motors in the various shops.

NEWTON, KANS.—The Electric Light & Power Company will spend $10,000 in improvements to its power plant. When the new machinery has all been installed it will practically be a duplicate plant. The present engine has 300-horsepower capacity, while the new engine will be 400. A condenser for the new engine, and a new switchboard will be installed.

GREENFIELD, IND.—The City Council has ordered the superintendent of the electric light plant to remove all the wires crossing streets and alleys from the Mitchell plant in this city. For some time a number of persons have been supplied with electricity from this private plant and the City, which maintains the public plant, considers that it should have the patronage. S.

ONTARIO, IND.—The Riverside Electric Company has incorporated to manufacture, generate and distribute electricity to towns and cities and the public generally for light, power and heat in Ontario and Lagrange County. The initial capital stock is $10,000. This will be increased subsequently. The directors are: John C., Harry F., and Arthur L. Cain. S.

INDIANAPOLIS, IND.—The Merchants Heat and Light Company and the Indianapolis Light and Heat Company have secured franchise rights to extend their lines to a number of towns and cities within a radius of twenty-five miles. They propose to furnish electric light and power to the farmers along their lines and to the citizens of the towns and villages within the radius. S.

KOKOMA, IND.—The Kokomo Utilities Company has filed articles of incorporation. The capital stock is $10,000. The object of this company is to build a system to distribute hot-water and steam heat and electric current for heat, light and power purposes in Kokomo and vicinity. J. B. Carter, L. J. Kirkpatrick, T. C. McReynold and George J. Marott are the incorporators. S.

SEAFORD, DEL.—There is talk of erecting an electric light plant at Seaford, for the purpose of furnishing electricity to Seaford and a number of other Sussex County towns. This movement has been on foot many times, but it is not likely active work will begin until after the contract expires with the Sussex Light and Power Company, which is now furnishing electricity to Seaford.

HEYBURN, IDAHO.—The towns of Heyburn and Ruppert, both on the Minidoka irrigation project will soon be supplied with power from the government dam. The transmission line for commercial purposes is completed, the towers for the Snake River crossing are in place, and work has been begun on the substation at Heyburn. The Ruppert substation is completed and the transformers are on the ground.

COLORADO SPRINGS, COLO.—The Pike's Peak Hydro-Electric Company and allied corporations of this city have issued $3,500,000 worth of ten-year, five-per-cent mortgage bonds. A former issue of $2,000,000 will be retired and the remainder of the money accruing from the new issue will be used for the carrying out of extensive improvements. The entire issue has been taken by the New York Trust Company.

ASHEBORO, N. C.—Engineers of the Southern Power Company have begun a survey of the proposed route for the transmission lines of the Company to this town by way of Randleman, from High Point, on the main transmission lines. It is expected that both Randleman and this place will liberally subscribe and contract for power for manufacturing, much being for woodworking and textile plants. L.

WILLIAMSBURG, VA.—A special committee, composed of M. H. Barnes, W. C. L. Taliaferro and J. R. Jordan, from the board of visitors of William and Mary College, met to consider the plans and specifications for a light and water system at that institution. Architect Wiley, of Lynchburg, was authorized to draft plans and specifications after which bids will be asked. A plant costing $25,000 is contemplated.

PEORIA, ILL.—The Municipal lighting plant at Princeville nas been taken over by E. L. Brown of the Elmwood Electric Lighting Company. This plant was operated by a gasoline engine and was not large enough to supply the demand. Mr. Brown will extend his lines to Princeville and light the town from the Elmwood plant. He is now furnishing a group of towns from his plant and on the new extension will also light Monica. V.

PORTLAND, ORE.—Creditors of the Deschutes Irrigation and Power Company have pooled their claims aggregating $800,000 and filed a petition for immediate foreclosure of the first mortgage on the Company's property. C. M. Redfield has been appointed re-

ceiver. The creditors intend to buy the property at the advertised sale and wind up the affairs of the Deschutes Irrigation and Power Company by the organization of a new holding company. A.

TOLEDO, O.—The Toledo Railways & Light Company is making extensive improvements at its Madison Avenue power house. When completed there will be in place a battery of twenty-eight boilers of a capacity ranging from 375 to 600 horsepower. Additional capacity of 3,600 horsepower in six boilers is now being installed. New furnaces, with chain grate stokers are also being put in. H.

TOLEDO, O.—A large number of new contracts in East Toledo, including the lighting of the new docks of the Cincinnati, Hamilton & Dayton Railway, have made necessary the laying of another cable across the Maumee River. Work has been started on the digging of the big trench across the river, starting near the foot of Madison Avenue, to accommodate the new system of electric light and power cables to be installed by the Toledo Railways & Light Company. H.

ST. LOUIS, MO.—The Suburban Electric Light and Power Company, parcel of the North American Company, has increased its capital stock by $750,000. Of the new stock, $500,000 is preferred and $250,000 common. The preferred stock bearing seven per cent interest with a cumulative dividend. The company will issue $250,000 common stock and $250,000 preferred stock at once. The rest of the common stock will be held in the treasury, to await future expansion.

BELLEVILLE, ILL.—This city has closed a ten-year contract with the St. Clair County Gas and Electric Company for street lights. A total of 350 arc lamps is to be used at the rate of $70 per year each. The lighting company agrees to light all city buildings and grounds, including the three fire department houses, market hall and city stables, free. The city now has 329 lights in service. The free-light concessions and the reduced price, secured will save the city $10,000 in the contract period.

KINGMAN, ARIZ.—The concrete work for the new unit that is to be installed at the power plant in Kingman, Ariz., is about completed, and the machinery will be put in place as soon as it arrives. The new unit will double the power of the plant and enable the greater distribution of electric power throughout the district adjacent to Kingman. The transmission line will be extended to the Union Pass section, where power will be used by the Frisco Mining and Power Company in the operation of its mines and mill.

MUNCIE, IND.—The American Gas and Electric Company, owner of seventeen electric and gas plants in New York, New Jersey, Pennsylvania, Indiana and Ohio, including the electric plants in Muncie, Marion, Hartford City and Dunkirk, Ind., is perfecting its plans to supply all the cities named, and several other towns where it has obtained franchises, with electric light and power furnished from the big central power house in Muncie. The recent purchase of the Hartford City and Dunkirk electric plants, and the franchises in Redkey, Gas City and Jonesboro were steps in the direction of the company's centralization scheme.

ASHEVILLE, N. C.—It has been announced that the Weaver Power Company which now operates a hydroelectric plant five miles below Asheville and is constructing another with 5,000 horsepower below Mashville, is preparing to build transmission lines to Canton to furnish 1,300 horsepower to the Champion to the Champion Fiber Company. This line will later be extended to Waynesville and other nearby towns in that direction while it is probable that another will be built to Hendersonville to furnish power. The fiber company's auxiliary steam plant is being operated all the time but this does not furnish sufficient power at reasonable rates.

WAHPETON, N. D.—The Otter Tail Power Company is about to install a considerable addition to its plant in this city. Owing to low water at Dayton Hollow dam the past summer the company has found it difficult to furnish sufficient power to run the electrical appliances in Wahpeton, Fergus Falls and Breckenride, and the new power plant to be erected here will be sufficiently powerful to furnish current to the cities, should the plant at the dam give out. About 500 horsepower additional machinery will be added to the plant in this city making a plant capable of generating 800 horsepower, or enough to run the three cities interested. The new machinery will be in operation about November 1.

SAN FRANCISCO, CAL.—G. R. Field, assistant to H. H. Sinclair, general manager of the Great Western Power Company, announces that the power plant at Big Bend is nearing completion. The Company has issued a statement of earnings showing a comparison of the first seven months of the present year with the last seven months of 1909. This shows an increase in gross earnings of $16,890, a decrease in operating expenses of $15,277, and an increase in net earnings of $33,066. The company reports a number of very large contracts to supply power, these contracts to begin early next year. These include: Contracts with the Southern Pacific Railroad Company for power for the operation of its suburban trains between San Francisco and Oakland, Berkeley and Alameda, a contract with the Pullman Company for power for its shops now being built on the east side of San Francisco Bay near Richmond, Cal., a contract with the Giant Powder Company and a contract with the California Cotton Mills. A.

ELECTRIC RAILWAYS.

(Special Correspondence.)

AURORA, ILL.—The Aurora, Elgin & Chicago Railway Company will install a 1,200-horsepower boiler at its power plant. Z.

SAN RAFAEL, CAL.—W. L. Courtright, has been granted a forty-nine-year franchise for a street railway to traverse the main thoroughfares of this town.

DULUTH, MINN.—A resolution has been passed by the council instructing the city engineer to lay out a route for the street car lines of Grand Avenue to Fond du Lac. C.

SPRINGFIELD, MO.—According to recent information a company has been incorporated to build an electric line between Kansas City and Springfield, by way of Eldorado Springs, Mo.

PHOENIX, ARIZ.—General Manager Mitchell of the Phoenix Railway Company has announced that his company intends to spend between $125,000 and $135,000 in improvements and extensions in this city and vicinity before July 1 of next year.

MINNEAPOLIS, MINN.—The Minneapolis Northern Suburban Railway Company has been incorporated by John J. McCarthy, Paul J. Marvin and others, with a capital of $250,000, to build an electric railroad to Little Falls, Minn. C.

HARRISBURG, PA.—Governor Stuart of this state has approved the charter of the Wilkes-Barre and Luzern Street Railway Company to construct and operate a line a mile long in Kingston. The Company has $6,000 capital.

PALMYRA, MO.—Work is progressing rapidly on the line of the Hannibal & Northern Missouri Railroad. It is expected that the section between Palmyra and Philadelphia will be completed in less than three months.

EVANSVILLE, IND.—The work of surveying for a traction line from this city to Louisville was begun September 21. It is understood that the Evansville Traction interests are back of the work. S

MARTINSVILLE, IND.—Interest has been revived in the proposed traction line from this city to Bloomington. Meetings held by business men indicate their purpose to push the enterprise to a successful conclusion. S.

MICHIGAN CITY, IND.—The work of double tracking the South Shore line from Pullman to Gary is progressing rapidly and the officials hope to have the new track in use by November 15. S.

HOPKINSVILLE, KY.—Announcement has been made of the practical completion of financial arrangements for an electric interurban line from here to Guthrie, via Pembroke and Trenton. A number of local business men are financially interested.

MILWAUKEE, WIS.—The Milwaukee Western Electric Railway Company has been given permission to issue stock certificates in the sum of $1,000,000 and bonds in the sum of $2,500,000. Officials of the road say they are ready to begin construction of the road as soon as a franchise into the city has been granted them. Z.

ALBANY, ORE.—Extension work has been started on the Albany electric system, and the car line which runs from the depot to the hotels of Albany through First Street will be extended to Seventh on Calapooia and westward to the limits of the city and out on the county road passing the two cemeteries.

GREEN BAY, WIS.—Electric current to run the interurban and city cars of the Green Bay Traction Company, to light Green Bay and to operate factories will be furnished within a short time by the Northern Hydro-Electric Power Company from its plant at High Falls.

DENVER, COLO.—An elevated automatic railroad is to be built in Summit County for the purpose of transporting ores in the Montezuma mining districts. The road, which is to be operated by electricity, will cost approximately $200,000. It is to be twelve miles in length, running between Keystone and Montezuma.

MARTINEZ, CAL.—The engineers of the Oakland and Antioch Railway Company have completed their survey of the line. The company reports the arrival of 60,000 ties and three carloads of steel rails at Bay Point. The coaches for the road have now been ordered and are to be delivered by November 1. A.

RICHMOND, VA.—A permit has been issued to the Richmond and Henrico Railway Company to construct a power house on Lester Street, between Louisiana and Orleans Streets, near the river front. The building will be of reinforced concrete, one story high, 76 feet by 80 feet, and will cost $23,000.

SALT LAKE CITY, UTAH.—Lee Neilsen and his associates have been granted the amended franchise for an interurban electric railroad from Wellsville to Hyrum, thence along the east edge of the valley to Logan, touching the towns of Millville and Providence. From Logan, the line is to go through Greenville to the Idaho State line passing through Hyde Park.

SAN FRANCISCO, CAL.——The Public Utilities Committee has passed a resolution recommending the sale of the proposed Parnassus avenue car line to Thos. W. Watson. The residents of the Sunset District have been working for this franchise for two years. If it is granted, the line, which is to be only one mile long, will be completed this year. A.

SULPHUR, OKLA.—At a mass meeting it was decided to construct a street-railway system, and necessary franchises have been promised. The contract given guarantees the completion of the street railway from Bromide Springs in Platt National Park to the Artesian Hotel by December 1.

SANDY, UTAH.—Residents of this part of Salt Lake County are eager to have the Utah Light and Railway Company extend its interurban street car service to Draper. A number of petitions to this end are being circulated. Draper is being assisted in its campaign to secure the extension by the commercial clubs and town councils of Murray, Midvale and Sandy.

LOS ANGELES, CAL.—Improvements involving the expenditure $500,000 have been planned by the Los Angeles-Pacific Railroad Company. The improvements will include the relaying and repaving the tracks on Sunset Boulevard. Fifty modern high-power interurban cars will be installed on the line, beginning a ten-minute service to Hollywood, on which the commutation tickets will be sold at five cents per trip. A.

HOOPPOLE, ILL.—The electric railway between Hooppole and Tampico, which has been under construction for the last two years has been completed and was accepted at a meeting of the directors. A decision is expected within a few days regarding a proposition to build to Geneseo, a distance of fifteen miles. There is also a proposition being considered to build to Annawan, ten miles away.

CONSHOHOCKEN, PA.—A grant for the extension of the Philadelphia and Western Railroad to West Conshohocken has been filed and approved. The description shows that the proposed trolley road will reach West Conshohocken over Haverford road, Old Lancaster road, Chester and Radnor road and Matson Ford road. The official name of the railroad company for which the extension is authorized is "The Terminal Railway Company."

STERLING, ILL.—Directors were elected by the stockholders of the Sterling, Dixon and Eastern Electric Railroad, as follows: Clement C. Smith, Milwaukee; John I. Beggs, Milwaukee; Robert Camp, Milwaukee; J. W. Johnson, Chicago; J. H. Lawrence, Sterling; E. E. Downs, Chicago, and Fred Watson, Dixon. The following officers were chosen: President, John I. Beggs; vice-president, and general manager, Clement C. Smith; treasurer, Robert Camp. Z.

NORTH ADAMS, MASS.—The contract for a $75,000 power house to be erected at Zylonite by the Berkshire Electric Street Railway, near the site of the present power house, has been awarded to Frederick T. Ley and Company of Springfield. The plant will be in operation about January 1. The plant will supply power to the Bennington line, and is probably being built in anticipaton of the building of the proposed line up Mt. Greylock and other extensions in this section. The building will be 150 by 100 feet, of concrete.

HYATTSVILLE, MD.—The Washington Spa Spring and Gretta Railroad Company, which recently put in operation an electric line from Fifteenth and H Streets, Northeast, Washington, to the junction of Sand and Main Streets, Bladensburg, is seeking permission to extend its line through Bladensburg over the Washington-Baltimore Boulevard as far as the Baltimore and Ohio Railroad depot in Hyattsville. It was suggested, at a recent council meeting, that the railroad company take the matter up with the State Highways Commission of Maryland.

BRISTOL, WASH.—It now seems that the proposed electric railway from White Salmon to the northern portion of the White Salmon valley with an ultimate terminus at Glenwood, is sure to be built. Stock solicitors are now in the field for the concern, which is to be called the Mount Adams Railway Company. About $75,000 of the required $100,000 stock has been already subscribed. A complete detailed route for the entire line has been prepared, but according to present plans, the line will only be built to start with to the Camas Prairie country, taking in the towns of Fulda and Laurel.

MONTROSE, COLO.—Sections of the Uncompahgre Valley in Montrose County and the Gunnison Valley in Delta County will be traversed by an electric railroad. A company has been formed for this purpose with T. P. Townsend of Denver, president, and E. L. Osborne, of Montrose, an official of the Company. The proposed road will connect Montrose, Olathe, Delta, Hotchkiss and Paonia and will traverse a section of rich lands now ten or twelve miles from a railroad. Work will be begun as soon as the necessary surveying can be done. Power will be obtained from the canal in the Gunnison tunnel irrigating project if satisfactory arrangements can be made with the United States Government.

LOGAN, UTAH.—Articles of incorporation of the Cache Valley Amusement Company have been filed here. The purpose of the company, which is composed largely of Salt Lake people, is to build a big amusement resort at Millville and construct and operate an electric line through Logan between Millville and Hyde Park. This line is eventually to become a portion of the Bambergers' interurban line. The capital stock of the company is $100,000 in shares of $1 each. Officers are: Job White, president; John E. Wiscomb, vice-president; W. J. Phillips, secretary, all of Salt Lake, and Leo Nielsen of Logan, treasurer. These men, with George A. Hansen of Salt Lake, constitute the board of directors.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

WATERTOWN, S. D.—The council has ordered telephone poles removed from the streets and wires to be put underground. C.

BISMARCK, N. D.—The Collins Wireless Telephone Company is planning the erection of stations here and also at Fargo and Beach. C.

MILNOR, N. D.—The Milnor Rural Telephone Company, having built thirty miles of new lines this past summer, is extending its lines out of here. C.

STROUD, N. D.—The Dakota Western Telephone Company has let the contract for the construction of a line to Alexander, Arnegard and Schaefer. C.

CLIFTON SPRINGS, N. Y.—The Clifton Springs Telephone Company announces that it has purchased a new switchboard to be used in the local exchange.

HOUSTON, TEX.—A new telephone exchange is to be built by the Southwestern Telephone & Telegraph Company. Definite plans regarding size and equipment have not yet been announced.

MINOT, N. D.—The Farmers Co-operative Telephone Company has been incorporated with a capital stock of $50,000. The incorporators are: D. E. Kidder, C. G. Richards and others, all of this town.

PIERRE, S. D.—The Southeastern Telephone Company, which is building southeast from this city, is now operating its lines to the southeast corner of this county, and will extend on down across the southern end of Hyde county into Buffalo and Jerauld counties.

COLUMBUS, O.—The Central Union Telephone Company is to be reorganized, the property in Indiana, Illinois and Ohio being divided under three incorporations. Bonds will be given to the American Telephone and Telegraph Company, which controls the Central Union.

FREMONT, NEB.—The Nebraska Telephone Company has agreed to remove its poles from the business section of the city by July 1, next. This is in accordance with a request of the business men who are to put in a special lighting system and who want all poles and signs off the business streets.

TOLEDO, O.—Announcement has been made that by November 1, the Pere Marquette Railroad will have in working order, on the Toledo division, a telephonic dispatching system which takes in the Saginaw division to the Ohio terminal. The equipment, which will be the first on the road, will cost in the neighborhood of $16,000. It is expected to reduce wrecks to a minimum. H.

MARSHALLTOWN, IA.—The fight against the Marshalltown Telephone Company has resulted in the organization of an independent company, a meeting of a citizens' committee and a committee from the rural telephone line directors being held for the taking of preliminary steps. The selling of stock will begin at once and the new company will probably be organized with capital stock of from $75,000 to $100,000. A mass meeting was held October 1 to complete the organization.

LEWISTON, IDAHO.—The Interstate Telephone Company has submitted a proposal to the Commercial Club to extend its line to Lewiston from a point in Spokane County near Spokane and here connect with the Nez Perce Co-operative Company, thus securing direct connections to all sections of Nez Perce and Idaho counties. The proposed extension will cost approximately $100,000 and the Commercial Club has been asked to lend its indorsement to the project to facilitate the sale of the bonds and securities to investors in the territory to be served.

ELECTRICAL SECURITIES.

The volume of trading during the past week was more by 300,000 shares than for the preceding week. Many stocks which have been quiet for weeks began to show activity and the entire market became more optimistic. Steel stocks were firmer, reflecting improvement in the market. Wire consumption continues heavy, and the export business of the United States Steel Corporation is flourishing. Contracts for pig iron in September aggregated 300,000 tons, or thirty-three and one-third per cent more than in August. The bond market continued to improve, aided by the reports of the sale of large blocks of American railway securities abroad. The improvement in bonds has materially helped to steady the stock market. As in August, the greatest activity of the steel market was in wire products, while the greatest falling off in tonnage was in structural and fabricated steel. Because of the increase in export tonnage rail orders were larger than in August, the September business aggregating 90,000 tons.

Combined earnings of the South Side, Metropolitan and Northwestern elevateds, of Chicago, for the year ended June 30, were $1,100,205, against $848,619 last year.

J. P. Morgan & Company and Drexel & Company, have bought $4,000,000 Public Service Corporation of New Jersey five-per-cent three-year collateral gold notes, secured by deposit of $5,000,000 general mortgage bonds of that company.

The Chicago & Oak Park Elevated Company's gross, for the year ended June 30, was $836,837, an increase of $14,531, or 1.76 per cent, which compares with 3.59 per cent for the North-

western, 9.4 per cent for the Metropolitan, and 5.31 per cent for the South Side Elevated. Oak Park Elevated's passenger earnings last year were $802,581.

Holders of the $953,000 first mortgage six per cent bonds of the Metropolitan Railway Company, of Denver, which mature on January 1, 1911, are notified that through Clark, Dodge & Company, they may exchange their bonds at par and accrued interest to maturity, for first and refunding sinking fund mortgage twenty-five year five per cent bonds of the Denver City Tramway Company at ninety-five and accrued interest to the date of exchange, or may receive cash at par and interest to date of delivery.

Stockholders of the Detroit United Railways Company have been offered $1,500,000 of treasury bonds, to be underwritten at eighty-two and one-half, the proceeds of which are to be used to reimburse the treasury for improvements, amounting to more than $4,000,000 since the beginning of 1907, made to the property out of earnings. According to President Hutchins, the resumption of dividends, which have not been paid since 1907, "will entirely depend upon the required amount of the underwriting being obtained."

DIVIDENDS.

American Power and Light Company, regular quarterly dividend of one and one-half per cent on the preferred stock, payable October 1 to stock of record September 29.

Bell Telephone of Missouri; quarterly dividend of two per cent, payable October 1.

Bell Telephone of Pennsylvania; quarterly dividend of one and one-half per cent, payable October 15.

Boston Suburban Electric; preferred quarterly dividend of $1 per share, payable October 15.

Mexican Light and Power; common quarterly dividend of one per cent, payable October 14.

National Carbon Company; quarterly dividend of one and one-half per cent, payable October 15.

Philadelphia Company; quarterly dividend of one and one-half per cent, payable November 1.

Public Service Corporation of New Jersey; quarterly dividend of one and one-quarter per cent, payable September 30.

Standard Underground Cable Company; regular quarterly dividend of three per cent, payable October 10 to stock of record October 5.

West Penn Traction Company; regular quarterly dividend of one and one-half per cent, on the preferred stock, payable October 15 to stock of record October 7.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

NEW YORK.

	Oct. 3.	Sept. 26.
Allis-Chalmers common	8¼	8
Allis-Chalmers preferred	29	29
Amalgamated Copper	64¾	61½
American Tel. & Cable	77	69½
American Tel. & Tel.	138	137
Brooklyn Rapid Transit	76½	76
General Electric	144	142¾
Interborough-Metropolitan common	21¼	21⅜
Interborough-Metropolitan preferred	56¾	57
Kings County Electric	123	123
Mackay Companies Postal Telegraph and Cables) common	91½	92
Mackay Companies (Postal Telegraph and Cables) preferred	75	73½
Manhattan Elevated	143½	137½
Metropolitan Street Railway	*18	*18
New York & New Jersey Telephone	103	103
U. S. Steel common	69½	67¾
U. S. Steel preferred	116⅞	116¼
Western Union	75⅝	65¼
Westinghouse common	66	61
Westinghouse preferred	128½	130

*Last price quoted.

BOSTON.

	Oct. 3.	Sept. 26.
American Tel. & Tel.	138	137¼
Edison Elec. Illuminating	258	257
General Electric	144	142¾
Massachusetts Electric common	20	18
Massachusetts Electric preferred	84¼	81
New England Telephone	130	128½
Western Tel. & Tel. common	19	16
Western Tel. & Tel. preferred	88	83

PHILADELPHIA.

	Oct. 3.	Sept. 26.
American Railways	43	43
Electric Company of America	11½	11½
Electric Storage Battery common	48½	47
Electric Storage Battery preferred	48½	47
Philadelphia Electric	15⅞	15⅝
Philadelphia Rapid Transit	18¾	18¼
Philadelphia Traction	82⅞	81
Union Traction	43¾	43½

CHICAGO.

	Oct. 3.	Sept. 26.
Chicago Railways, Series 1	60	60
Chicago Railways, Series 2	15½	15
Chicago Subway	4	4¼
Chicago Telephone	118	119
Commonwealth Edison	112	111
Metropolitan Elevated common	17	17
Metropolitan Elevated preferred	60	60
National Carbon common	125	125
National Carbon preferred	118	118

PERSONAL MENTION.

DAN W. BOWIE, former assistant city electrician, of Atlanta, Ga., has been elected city electrician, succeeding F. H. Miles, resigned.

WILLIAM MARCONI, who was reported to be in poor health, recently returned to Italy on board the *Princess Mafalda*. A later report states that he has not been ill at all.

CLARENCE H. MACKAY, with Mrs. Mackay recently returned from Europe after a three-months' automobile trip through Holland, Belgium and Germany.

C. A. CALDWELL, cashier of the Alton National Bank at Alton, Ill., has been elected vice-president of the Alton, Jacksonville & Peoria Interurban Railway to succeed Robert Curdie, resigned.

WARNER JONES, who was formerly with the Cleveland Electrical Supply Company of Cleveland, O., has lately formed connections with the Chicago office of the Nungesser Electric Battery Company of Cleveland.

A. S. WHITE, president of the Columbia Gas & Electric Company of Cleveland, O., recently arrived in New York after a trip to Europe. From New York he went to Cincinnati, where he will, in the future, be located.

MORGAN BROOKS, professor of electrical engineering at the University of Illinois, has resumed his work after a year's leave of absence, in the course of which he has made a trip around the world for study and recreation.

VROMAN A. SWETT, formerly with M. B. Austin, Chicago, Ill., has accepted a position with the Sprague Electric Company in that city. Mr. Swett will act as manager of the Sprague Company's conduit and supply department of the Chicago office.

JAMES A. KENNY, who formerly represented the American Electric Fuse Company in Chicago, has resigned his position. He will be succeeded by Fred B. Bonde, who will have temporary offices at No. 202 Medinah Temple, No. 185 Jackson Boulevard.

O. B. WOOTEN, formerly instructor in physics and electrical engineering at Missouri Agricultural and Mechanical College and for the past year instructor in physics at the Texas Agricultural and Mechanical College, has been appointed Research Fellow at the University of Illinois.

T. D. JENSEN, who for the past year has been with the Shawinigan Water and Power Company at Montreal, has been appointed assistant in the Department of Electrical Engineering at the University of Illinois. Mr. Jensen previously was with the General Electric Company.

C. F. BONNEY, formerly general manager of the Southern States Company, Norfolk, Va., was promoted on October 1 to the position of district manager of the Southern Bell Telephone Company of that city. Mr. Bonney succeeds L. J. Oliver who has accepted a position at the Company's headquarters in Atlanta, Ga.

JOHN J. SCHAYER has resigned his position as manager of the Electric Shop of the Commonwealth Edison Company, Chicago, Ill., and has accepted a joint position with the Commonwealth Edison Company and the Automobile Maintenance Company to create an increased use of electric traffic wagons.

GEORGE B. JOHNSON, formerly of the Contract Department, Commonwealth Edison Company, Chicago, Ill., has accepted an appointment to succeed John J. Schayer as manager of the Electric Shop of the same company. Mr. Johnson will, for the present at least, continue in charge of the show room of the Contract Department of the Commonwealth Edison Company, at 139 Adams Street, Chicago.

OBITUARY.

FRANCIS X. HORAN, who had charge of the Port Chester office of the Westchester Lighting Company for a number of years, and who was confidential clerk for Receiver Leslie Sutherland of the Yonkers Railroad at one time, died at his home from pneumonia at Tuckahoe, N. Y., October 2. Lately he had been employed in the Custom House in New York.

J. V. O'BRIEN, traffic manager of the Western Union Telegraph Company, died in San Francisco, Cal., September 12, of typhoid fever, after an illness of only two weeks. Starting as a messenger boy in the telegraph office, Mr. O'Brien arose to the position of operator. Then he was made manager of the city offices, succeeding T. J. Reynolds. Recently he was appointed manager of the traffic department. He has for years been a member of the Olympic and Corinthian Clubs. Mr. O'Brien is survived by a wife and two sisters.

PROPOSALS.

POST OFFICE, DEMOPOLIS, ALA.—The office of the Supervising Architect, Washington, D. C., will receive bids until November 7 for the construction, complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States post office at Demopolis, Ala., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at Demopolis, Ala., or at the Supervising Architect's office.

FOREIGN TRADE OPPORTUNITIES.

No. 5556. ELECTRIC MOTORS. An electric factory in a European country intends reducing the price of current used during the daytime, thus making it pay even to the small workshops to employ electricity as motive power. An American consul writes that in consequence of this there will shortly be a demand for electric motors from one-half to twenty horsepower. It is therefore advisable that American manufacturers of electric motors should send their descriptive catalogues with prices, cost, insurance and freight, to certain cities to the consulate in question for distribution among the intending users of electricity as motive power.

No. 5535. AUTOMOBILES.—An American consul in Latin America reports there are prospects of good openings for trade in the automobile business in his district in the near future. He states that in view of improvements about to be undertaken conditions are favorable for an aggressive campaign by automobile manufacturers. Agents should be appointed, sample machines sent for exhibition purposes, and advertising literature distributed. The name of a local business man who would be glad to obtain the agency for one of the leading American companies is given in the report of the consul.

No. 5570. PANAMA CANAL SUPPLIES. Sealed proposals, in triplicate, will be received at the office of the general purchasing officer of the Isthmian Canal Commission, Washington, D. C., until October 14, 1910, for furnishing the following supplies: Condenser, motor-driven engine lathe, valve-reseating machine, snatch blocks, punches and dies, rivet sets, machine bits, cold-shuts for steam shovels, coupler knuckle pins, manganese-steel plates, clam-shell bucket, electric fans, water gauges, fire brick, lumber, etc. (Circular No. 606.)

NEW PUBLICATIONS.

POWER CONTROL.—Under this title a new publication is being issued quarterly by the Woodward Governor Company, of Rockford, Ill. The contents is of especial interest to those interested in the use of water power. Containing, as it does, interesting matter relating to electric plants, textile, cotton and paper mills and other factories the magazine is a valuable acquisition to a reference library.

PAMPHLET STORY OF TRI-BOROUGH SUBWAY.—The New York Public Service Commission, First District, has issued a pamphlet describing the proposed Tri-borough rapid transit subway and elevated road. It gives a brief history of the system and its composite parts, made clearer by an outline of the points of difference between it and the Interborough. There will be four separate tunnels, with arrangements for better ventilation. The station platforms will be straight and built to accommodate ten-car express trains and six-car locals. Bids are to be opened for construction and operation by private capital of the whole system on October 20, and on October 27 for construction by sections with municipal funds.

NEW INCORPORATIONS.

EL CENTRO, CAL.—The Imperial Valley Electric Company has been formed here for the manufacture of all kinds of fixtures.

SAN ANDREAS, CAL.—The Patent Electric Fuse Splitter Company has been incorporated by Frank Bernardin, J. B. Sauve, T. C. Peters and F. M. Sorracco of Sutter Creek, with a capital stock of $200,000.

CHICAGO, ILL.—The Commercial Electric Motor Manufacturing Company has been incorporated with a capital of $10,000 to manufacture electric motors. Charles Endorf, Jr., C. V. Mount, and F. S. Schooler are the incorporators.

COLUMBUS, O.—The Public Securities Company has been chartered with a capital of $160,000, by Carl J. Kiefer, G. B. Gilbert, Jackson Kiefer, E. M. Gilligan and Henry Kiefer. The Company will take over the gas and electric plants in Hyomea, Spencer and Coal Mont, Ind., and reorganize the properties.

NEW YORK, N. Y.—The Shield Electric Company of Manhattan has been incorporated to deal in electric and other kinds of machinery. The capital is $5,000 and the incorporators are: Robert M. Schmid, Chas. P. Schmid, Jr., and Ernest E. Schmid, all of New York City.

NYACK, N. Y.—Articles of incorporation have been filed by the Electrical Improvement Company of Nyack, N. Y., to trade in all manner of electrical devices and maintain a laboratory for electrical and mechanical purposes. The capital stock is $100,000 and the directors are Charles A. Pearson, New York; Charles R. Hoe, Crawford, N. Y.; William J. Brewster, Orange, N. J.; Frank J. V. Beck, Brooklyn, and George H. Schubert, Newark, N. J. T.

ROCHESTER, N. Y.—The Telechronometer Company of Rochester and the North Electric Company of Cleveland, O., are to be consolidated in a new corporation to be known as the Telephone Improvement Company, which is to incorporate under the laws of this state. Frederick C. Stevens, state superintendent of public works, is to be the president of the new company which will control patents on telephone messages and time meters and switchboard improvements.

INDUSTRIAL ITEMS.

THE W. H. SCHOTT COMPANY, Chicago, Ill., announces that its office has been moved and is now located at 39 Jackson Boulevard, Suite 1805-09.

THE HUGHES ELECTRIC HEATING COMPANY, Chicago, Ill., has issued a bulletin describing and illustrating the Hughes electric cook stove. A number of stoves are listed.

THE OHIO BRASS COMPANY, Mansfield, O., includes in its September number of the *O.-B. Bulletin*, an interesting article on O-B suspension insulators. A number of illustrations are used to show how the insulators are arranged for test.

THE INDUSTRIAL INSTRUMENT COMPANY, Foxboro, Mass., describes in Bulletin No. 39 its industrial dial-type thermometers. One of the desirable features of the instruments is that their calibration is permanent, due to the fact that the system is sealed absolutely.

THE TRIUMPH ELECTRIC COMPANY, of Cincinnati, O., announces a change in address and management of its Chicago office. W. R. Bonham succeeds F. L. Merrill as manager and is located at 275 La Salle Street, instead of in the Manhattan Building as formerly.

THE DIELECTROL MANUFACTURING COMPANY, St. Louis, Mo., recently mailed Bulletin No. 12 on the subject of Dielectrol. This substance is a black paraffine insulating varnish, and is especially suited for dipping fields of motors or generators, and for treating armature coils and transformers.

THE ADAMS-BAGNALL ELECTRIC COMPANY, Cleveland, O., recently issued a folder on the illumination of factories and foundries by A.-B. regenerative flame arcs. The cover of the publication is illustrative of the lighting of a St. Louis foundry. Illustrations of the lamps are given and their characteristics explained.

THE ELECTRIC APPLIANCE COMPANY, Chicago, Ill., gives an account, in the September number of *The Electrical Trade*, of the history of manufacture of resistance materials. This company has, through the excellence of its products, succeeded in attaining a national reputation. Phoenix, Ideal, and the Company's other alloys are now widely used, and are daily increasing in popularity.

THE ALBANY INSTRUMENT COMPANY, Albany, N. Y., is mailing descriptive literature on Rollinson switchboards and transformers. The Rollinson dental switchboard, which is shown in one of the folders, is of especial value to those dentists who have found that it is profitable to keep pace with progress by using electricity in their work. Toy transformers and diagnostic lamp transformers are also mentioned.

THE TRIUMPH ELECTRIC AND THE TRIUMPH ICE MACHINE COMPANIES, Cincinnati, O., recently distributed a souvenir booklet of the inspection trip of Cincinnati's commercial organizations to its new plant. The booklet contains a history of the Company, noting its growth and progress from 1889, the year of its foundation. A number of engravings illustrating various parts of the plant are included.

THE THOMSON ELECTRIC WELDING COMPANY, Lynn, Mass., recently issued a pamphlet devoted to electric welding machines. Both the theory and practice of electric welding are quite thoroughly treated, and the illustrations give an excellent idea of the appearance of the device. In order to show a few of the many welds which may be made, illustrations of a number of miscellaneous sample boards are included.

THE GOLDSCHMIDT THERMIT COMPANY, New York, N. Y., announces an important change in its management. On October 1, E. Stutz, formerly vice-president and general manager, retired from the direction of the Company, which passed under the management of William C. Cuntz. Mr. Cuntz brings to his position a thorough knowledge of the steel business and a wide acquaintance with the railway and street-railway officials of the country.

THE AMERICAN SHIP WINDLASS COMPANY, Providence, R. I., illustrates in a recent folder, the operation of the Taylor furnace. The underfeed, overfeed and "Taylor" stoker are all briefly described, noting the class of work for which each is especially adapted. The "Taylor," which combines the desirable points of the overfeed and underfeed types, at the same time omits the undesirable features. The increase in efficiency of the "Taylor" over other types is said to be especially marked with low-grade Western fuels.

THE WALKER ELECTRIC COMPANY, Philadelphia, Pa., has published a book on the past, present and future of the switchboard. It was with a double purpose that this book was prepared. The first idea was to raise the standard of switchboard business throughout the country and the second to call attention to the facilities of the Company. The primary idea of the Company is that the swichboard should be designed for the plant in which it is to be installed, rather than that the plant shall be adapted to meet the necessities of the switchboard builder. The history of the switchboard is treated in the book and a number of engravings of old boards are shown. Different makes of instruments and switchboard apparatus are described and a great deal of very interesting information is given. One of the most

notable features of the book is the excellence of the illustrations used. The publication is bound in cloth and is printed on a fine grade of paper.

DATES AHEAD.

Denver Electric Show, Colorado Electric Club, Denver, Colo., October 8-15.

American Street and Interurban Railway Association. Annual convention, Atlantic City, N. J., October 10-14.

New York Electrical Show. Madison Square Garden, New York, October 10-20.

American Society of Municipal Improvements. Annual convention, Erie, Pa., October 11-14.

Western Association of Electrical Inspectors. Sixth annual meeting, Omaha, Neb., October 11, 12 and 13.

Railway Signal Association. Annual meeting, Richmond, Va., October 12-15.

American Electrochemical Society. Eighteenth general meeting, Chicago, Ill., October 13-15.

Order of the Rejuvenated Sons of Jove. Eighth annual meeting, Birmingham, Ala., October 13-15.

American Iron and Steel Institute. First meeting, New York city, October 14 and 15.

Association of Iron and Steel Electrical Engineers. Next meeting, Hotel Schenley, Pittsburg, Pa., October 17-20.

Illuminating Engineering Society. Annual convention, Baltimore, Md., October 24-25.

Illinois State Electric Association. Annual meeting, Rock Island, Ill., October 25-27.

Texas Independent Telephone Association. Annual convention, Dallas, Tex., October 26 and 27.

American Association of Electric Motor Manufacturers. Semi-annual meeting, Chicago, November 14-16.

Directory of Electrical and Allied Engineering and Scientific Societies

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AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

AMERICAN SOCIETY OF CIVIL ENGINEERS. Secretary, Charles Warren Hunt, 220 West Forty-seventh Street, New York, N. Y.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Secretary, A. P. Folwell, 239 West Thirty-ninth Street, New York, N. Y.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. C. Donecker, 29 West Thirty-ninth Street, New York, N. Y.

AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary, H. E. Weeks, Tri-City Railway Company, Davenport, Iowa.

AMERICAN STREET AND INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION. Secretary, B. B. Davis, Columbus Railway and Light Company, Columbus, Ohio.

AMERICAN STREET AND INTERURBAN RAILWAY ENGINEERING ASSOCIATION. Secretary, J. W. Corning, Boston Elevated Railway Company, Boston, Mass.

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ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, Minnesota, St. Paul & Sault Ste. Marie Railroad, Chicago, Ill.

CALIFORNIA ELECTRIC RAILWAY ASSOCIATION. Secretary, L. E. W. Pioda, Oak and Broderick Streets, San Francisco, Cal.

CALIFORNIA STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary and treasurer, F. V. Meyers, 502 Grant Building, San Francisco, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Secretary, T. S. Young, Confederation Life Building, Toronto, Canada.

CANADIAN STREET RAILWAY ASSOCIATION. Secretary, Acton Burrows, 157 Bay Street, Toronto, Canada.

CENTRAL ELECTRIC RAILWAY ASSOCIATION. Secretary, A. L. Neereamer, Traction Terminal Building, Indianapolis, Ind.

CENTRAL ELECTRIC TRAFFIC ASSOCIATION. Secretary, J. T. Brittson, Chicago, South Bend & Northern Indiana Railway Company, South Bend, Ind.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary, F. D. Morris, Colorado Springs, Colo.

CONNECTICUT STATE STREET RAILWAY ASSOCIATION. Secretary, F. W. Poole, Bridgeport, Conn.

ELECTRICAL CONTRACTORS' ASSOCIATION OF INDIANA. Secretary, George Skillman, Indianapolis, Ind.

ELECTRIC CLUB OF CHICAGO. Secretary, F. S. Hickok, Marquette Building, Chicago, Ill.

ELECTRICAL CLUB OF CALIFORNIA. Secretary, Russell D. Holabird, Argonaut Hotel, San Francisco, Cal.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, George William Russell, Jr., 25 West Forty-second Street, New York, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, Ernest S. Cowle, 1613 Grand Avenue, Kansas City, Mo.

ELECTRICAL CREDIT ASSOCIATION OF CANADA, LIMITED. Secretary, William R. Staveley, Royal Insurance Building, Montreal, Canada.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederick P. Vose, 1343 Marquette Building, Chicago, Ill.

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ELECTRICAL VEHICLE AND CENTRAL STATION ASSOCIA-

TION. Secretary, H. T. Sands, 139 Pleasant Street, Malden, Mass.

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ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA. Secretary, Elmer K. Hiles, 2511 Oliver Building, Pittsburg, Pa.

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ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, H. E. Chubbuck, Mayer Building, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. Secretary, Preston S. Millar, Engineering Societies Building, 33 West Thirty-ninth Street, New York, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF MISSISSIPPI. Secretary and treasurer, J. B. Shannon, New Albany, Miss.

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NATIONAL ELECTRICAL INSPECTORS' ASSOCIATION. Secretary, T. H. Day, 27 Pliny Street, Hartford, Conn.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, T. C. Martin, 33 West Thirty-ninth Street, New York, N. Y.

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NEBRASKA ELECTRICAL ASSOCIATION. Secretary, Frank McMaster, Beatrice, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Alton F. Tupper, 84 State Street, Boston, Mass.

NEW ENGLAND SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, L. D. Gibbs, 39 Boylston Street, Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, John J. Lane, 12 Pearl Street, Boston, Mass.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, Engineering Societies Building, 29 Thirty-ninth Street, New York, N. Y.

NEW YORK RAILROAD CLUB. Secretary, H. D. Vote, 95 Liberty Street, New York, N. Y.

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NORTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary and treasurer, L. C. Kane, Kensal, N. D.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, N. W. Brockett, Cataract Building, Seattle, Wash.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, O.

OHIO INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Ralph Reamer, Columbus, O.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, F. E. Sanborn, Ohio State University, Columbus, O.

OKLAHOMA ELECTRIC LIGHT, RAILWAY AND GAS ASSOCIATION. Secretary, Galen Crow, Guthrie, Okla.

OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION. Secretary, Frank J. Sherrer, 195 Broadway, New York, N. Y.

ORDER OF THE REJUVENATED SONS OF JOVE. Mercury, Roy M. Van Vliet, Monadnock Block, Chicago, Ill.

PACIFIC COAST ELECTRIC VEHICLE ASSOCIATION. Secretary, A. H. Halloran, 901 Atlas Building, San Francisco, Cal.

PENNSYLVANIA ELECTRIC ASSOCIATION. Secretary, Van Dusen Rickert, Pottsville, Pa.

PENNSYLVANIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, H. E. Bradley, 135 South Second Street, Philadelphia, Pa.

PENNSYLVANIA STATE STREET RAILWAY ASSOCIATION. Secretary, Charles H. Smith, Lebanon, Pa.

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PITTSBURG ELECTRIC BOOSTERS' CLUB. Recording Wattmeter, O. R. Rombach, 919 Liberty Avenue, Pittsburg, Pa.

RAILWAY ELECTRIC SUPPLY MANUFACTURERS' ASSOCIATION. Secretary, J. Scribner, General Electric Company, Chicago, Ill.

RAILWAY SIGNAL ASSOCIATION. Secretary, C. C. Rosenberg, Bethlehem, Pa.

SOCIETY OF THE UNITED STATES MILITARY TELEGRAPH CORPS. Secretary, David H. Bates, 658 Broadway, New York, N. Y.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, H. H. Norris, Cornell University, Ithaca, N. Y.

SOCIETY OF AUTOMOBILE ENGINEERS. Secretary, Alexander Churchward, 30 Church Street, New York, N. Y.

SOCIETY OF WIRELESS TELEGRAPH ENGINEERS. Secretary, E. D. Forbes, Box 63, Brant Park, Mass.

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SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, W. B. Head, Stephensville, Tex.

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TELEPHONE SOCIETY OF NEW YORK. Secretary, T. H. Lawrence, Eighteenth Street and Irving Place, New York, N. Y.

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UNDERWRITERS' NATIONAL ELECTRIC ASSOCIATION. Secretary Electrical Committee, C. M. Goddard, 141 Milk Street, Boston, Mass.

VERMONT AND NEW HAMPSHIRE INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. B. Seeley, St. Johnsburg, Vt.

VERMONT ELECTRICAL ASSOCIATION. Secretary, A. B. Marsden, Manchester, Vt.

WASHINGTON SOCIETY OF ENGINEERS. John C. Hoyt, 1330 F Street, Washington, D. C.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 125 Monroe Street, Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS. Secretary, J. H. Warder, Monadnock Block, Chicago, Ill.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, John S. Allen, Lake Geneva, Wis.

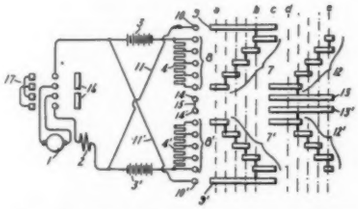
WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. C. Crowley, Jr., Superior, Wis.

WISCONSIN STATE TELEPHONE ASSOCIATION. Secretary, Paul J. Weirich, Monroe, Wis.

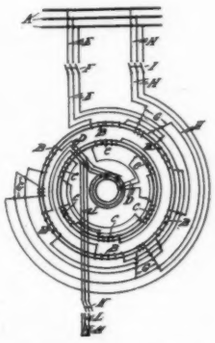
RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) September 27, 1910.

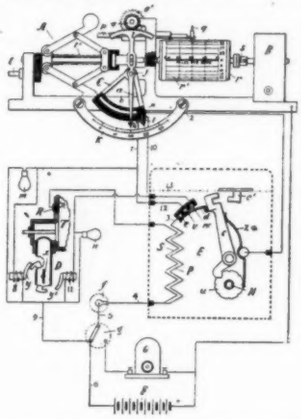
971,056. SYNCHRONOUS INDUCTION-MOTOR. Carl A. Lohr, Chicago, Ill. Filed October 29, 1906. The stator and rotor of an alternating-current motor are provided with polyphase main windings. There is an additional polyphase winding on the stator for starting the motor. This winding has a smaller number of poles than the main windings. Synchronous operation of the motor is effected by connecting the motor to an alternating-current source to operate the additional winding to start the motor with the main polyphase windings open, and then simultaneously connecting the main windings to an alternating-current source.



971,199.—SYSTEM OF MOTOR CONTROL.



971,056.—SYNCHRONOUS INDUCTION MOTOR.



971,334.—CONTROLLING MECHANISM FOR VEHICLES.

971,082. CIRCUIT-BREAKER. Frank L. Sessions, Columbus, Ohio, assignor to the Jeffrey Manufacturing Company. Filed August 6, 1903. Renewed September 14, 1905. An electromagnetic circuit-breaker has a magnet coil in circuit with each of two or more sources of electric supply which are connected with a working circuit taking current from them and with which this circuit can be connected in parallel or in series, at will.

971,101. ELECTRIC HEATING UNIT. Tycho Van Aller, Schenectady, N. Y., assignor to General Electric Company. Filed July 23, 1908. A resistance unit comprises a helical conductor coated with a thin refractory insulation and flattened onto itself.

971,163. MAGNETIC SEPARATOR. Bertram E. Wood, Colorado Springs, Colo. Filed December 27, 1909. Includes an electromagnet of special design.

971,170. TELEGRAPHY. Charles G. Burke, New York, N. Y., assignor of one-half to John Q. A. Whittemore, Newton, Mass. Filed Aug. 14, 1908. A book for telegraphic purposes consists of words composed of letters agreeing or differing in the number of electric units constituting their individual telegraphic symbols, but the aggregate of whose units are divisible and convertible into number symbols all of which have a like number of units.

71,184. VOLTAGE-REGULATOR. Richard Fleming, Lynn, Mass., assignor to General Electric Company. Filed July 23, 1908. A regulator for an alternating-current system has a controller therefor in a circuit charged from the line, and means for rendering the circuit substantially neutral to variations of line frequency.

971,192. ELECTRIC-LIGHT SUPPORT. Thomas Gray, Buffalo, N. Y. Filed October 1, 1906. The lamp is pivoted to an adjustable telescopic arm.

971,198. PROCESS FOR THE MANUFACTURE OF METALLIC SODIUM. Paul Leon Hulin, Grenoble, France, assignor to Société d'Electro-Chimie, Paris, France, and Paul Léon Hulin, Grenoble, France. Original application filed October 27, 1908. Divided and this application filed June 2, 1909. The process consists in subjecting fused caustic soda to electrolysis, withdrawing the cathode periodically, bringing it into contact with water to restore its efficiency, and then replacing it for continuing the electrolytic operation.

971,199. SYSTEM OF MOTOR CONTROL. Leopold Janisch, Berlin, Germany, assignor to General Electric Company. Filed September 1, 1909. Two sources of current have unlike poles connected to the terminals of the motor; two resistances are respectively connected at one end to the other poles of the sources; means are provided for connecting the free end of each resistance with that pole of the other source corresponding with that of the source to which the fixed end of the resistance is connected, and also means for simultaneously shifting the connections from the free ends to the fixed ends of the resistances.

971,203. FIXTURE FOR ADJUSTABLE ELECTRIC DROP-LIGHTS. Harry Wallace Lawrence, Denver, Colo. Filed June 14, 1909. In combination with a lamp and a counterbalancing weight, having a grooved roller, are: a nonconducting ceiling plate having terminals adapted to be connected with circuit feed wires; a nonconducting block secured to the plate having terminals in contact with the feed-wire terminals; a nonconducting grooved roller mounted in the block; and circuit wires connected to the lamp, which extend through the weight and around the roller in the block, thence around the weight roller to the terminals upon the block.

971,205. FUSE-MOUNTING. William Merz, New York, N. Y., assignor to Western Electric Company, Chicago, Ill. Filed October 28, 1907. There is a tubular shell with a molded metal cap about the end of the shell, a terminal bolt (embedded in the cap) having a hole therein, and a fuse wire passing through the shell and having its end secured in the hole in the bolt.

971,216. FITTING FOR ELECTRIC CONDUITS. William C. Robinson, Pittsburg, Pa. Filed May 29, 1909. A device for connecting branch lines to conductors inclosed in conduits, includes a block placed within a conduit, terminals for the conductors carried by the block but insulated from each other, and means carried by the block for securing the block within the conduit.

971,226. ELECTROLIER. Joseph W. Turner, Des Moines, Iowa. Filed August 4, 1909. A post having a number of openings

near its upper end has an arm detachably connected with it to cover one of the openings, and a plate similarly connected with it to cover another of the openings.

971,237. TELEPHONE. Joshua W. Atlee, Riverton, N. J. Filed June 4, 1908. Includes a sound-amplifying horn.

971,241. PORTABLE ELECTRIC LIGHT. Joseph Block, New York, N. Y. Filed February 21, 1910. Has a two-part circuit closer.

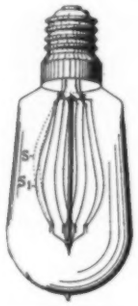
971,244. APPARATUS FOR OZONIFYING. Charles S. Bradley, New York, N. Y. Filed October 29, 1906. An ozonifier comprises a plurality of electrodes and dielectrics spaced between them, the dielectrics being twice as thick as the width of the spaces between them and the electrodes.

971,249. ELECTRIC RAILWAY SAFETY SYSTEM. Antonio Casale, Scranton, Pa. Filed June 18, 1909. An air-brake connection is described.

971,265. HEADLIGHT FOR VEHICLES. Bowen R. Gover, Newton, Iowa. Filed June 20, 1910. An extension to a vehicle pole or shaft contains an electric lamp, etc.

971,309 and 971,310. WATCHMAN'S CLOCK. Richard C. Rose, Osceola, Ark. Filed March 10, 1910. Comprises a progressively movable contact hand or arm, other contacts movable into and out of the path of the hand or arm, a polarized armature lever carrying the contacts, electromagnets for causing the movement of the armature lever, means controlled by the hand or arm for causing the energizing of the electromagnets in one direction, and manually controllable means for causing the energizing of the magnets in the other direction.

971,322. MINE-INSULATOR. Charles W. Speakman, Monongahela, Pa. Filed November 29, 1909. An insulator comprises a body portion having its bottom formed of a pair of spaced lugs to provide a keyway, this body portion being further provided with a longitudinal opening having its lower end arranged to one side of one end of the keyway.



971,452.—INCANDESCENT LAMP.

971,334. CONTROLLING MECHANISM FOR VEHICLES. John T. Whalen, Brooklyn, N. Y. Filed May 24, 1907. A speed-controlling apparatus comprises an electrically operated fuel-throttling device; an electric igniter, a source of electricity, a switch connected to the fuel-throttling device and igniter, a second switch connected to the switch, source of electricity and fuel-throttling device, and a lock actuating the second switch.

971,351. BERTH-LAMP. William J. Bohan, St. Paul, Minn. Filed August 19, 1909. A wall lamp comprises a cylindrical body having a lateral opening, a slide for closing the opening, an electric lamp mounted in the body, an electric circuit leading to the body, one branch thereof being normally open, and a contact piece carried by the slide for electrically uniting the terminals of such branch.

971,352. PARTY-LINE-INDICATING SYSTEM. Clifford C. Bradbury, Chicago, Ill., assignor to Kellogg Switchboard and Supply Company, Chicago, Ill. Filed March 13, 1908. Supervisory signals for a cord circuit connected to the party line are adapted to be individually displayed according to the substation (on the party line) which is called.

971,363. CONNECTION FOR ELECTRIC CARS. Joseph Vincent Doyle, New York, N. Y. Filed January 6, 1910. An electric connection between the car body and the truck-mounted motor comprises abutting members movable relative to each other at their abutting points to allow for the relative movements of the car body and the truck.

971,385. METALLIC FILAMENT. Isidor Kitsee, Philadelphia, Pa. Filed August 10, 1910. The process consists in producing an ingot of the phosphide of the metal out of which the filament should consist, converting this phosphide into the metallic state with the aid of electrolysis, subjecting simultaneously the reconverted metal to heat and mechanical stress, and drawing out this metal to a wire of required thickness at a temperature higher than normal.

971,399. TROLLEY. Joseph Ország and John Ország, Ashtabula, Ohio. Filed January 12, 1910. Has special guard features.

971,413. IGNITER FOR GAS OR OTHER INTERNAL-COMBUSTION ENGINES. George Z. Smith, Salt Lake City, Utah. Filed January 6, 1910. A spark plug has electrodes which may be rubbed against each other to clean them.

971,419. ELECTRIC SWITCH. George B. Thomas, Bridgeport, Conn., assignor to the Perkins Electric Switch Manufacturing Company, Bridgeport, Conn. Filed December 17, 1908. A switch spindle is described.

971,423. LOCK. Frank Walters, Spokane, Wash. Filed May 6, 1910. An electrically controlled lock.

971,452. METALLIC INCANDESCENT FILAMENT. Anton Lederer, Atzgersdorf, near Vienna, Autria-Hungary, assignor to Westinghouse Lamp Company, Bloomfield, N. J. Filed August 25, 1906. An incandescent electric lamp has metallic filaments, a central support about which the filaments are cylindrically arranged, the filaments being of loop shape, leading-in wires to which the terminals of the filaments are secured, anchors engaging the looped portions of the filaments, the filaments being bowed between the supporting ends and the anchors whereby the loops are resiliently pressed against their respective anchors.

971,453. INCANDESCENT ELECTRIC LAMP. Anton Lederer Atzgersdorf, near Vienna, Austria-Hungary, assignor to Westinghouse Lamp Company, Bloomfield, N. J. Filed August 30, 1906. The two light-giving portions are each arranged in the form of a hollow cylinder, the lines of the filament forming such cylinder being substantially parallel with its axis.

971,485. TROLLEY-HARP. Lewis E. Bradt, Santa Monica, Cal. Filed October 5, 1909. Has wire-replacing spirals connecting with the groove.

971,490. HOLDER FOR ELECTRIC-LIGHT GLOBES. Ava I. Chandler, Marion, Ohio. Filed December 22, 1909. In combination with adjustable socket and shade-engaging members are braces connecting the same, and means formed therein whereby the braces may engage the shade.

971,494. TROLLEY-CAR-POLE ATTACHMENT. George R. Dunn, San Pedro, Cal. Filed October 13, 1909. Permits sidewise deflections.

PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issue by the United States Patent Office) that expired October 3, 1910:

505,808. ELECTRIC TIME CUT-OUT. Frank Beland, Cairo, Ill.

505,819. FIRE ALARM SYSTEM. Harry T. Downs, New York, N.Y.

505,822. PROTECTOR FOR PIPES FROM POWERFUL ELECTRIC CURRENTS. Frederic Enger, St. Louis, Mo.

505,833. CONTACT FOR SIGNALING TO CARS. Frank E. Kinsman, Plainfield, N. J.

505,841. CONDUIT ELECTRIC RAILWAY. Lawrence A. McCarthy, Brooklyn, N. Y.

505,859. ALTERNATING-CURRENT MOTOR. William Stanley, Jr., and John F. Kelly, Pittsfield, Mass.

505,911. RHEOSTAT. Alexander Würts, Pittsburg, Pa.

505,912. CLEAT FOR HOLDING INSULATED ELECTRIC WIRES. Elisha W. Buffington, Fall River, Mass.

505,913. INCANDESCENT ELECTRIC LIGHT. Henry D. Burnett, Lynn, and Samuel E. Duane, Swampscott, Mass.

505,914. REGULATOR FOR DYNAMOS. William H. Elkins, Cambridge, Mass.

505,917. TRANSMITTING TELEPHONE. Silas W. Holman, Boston, Mass.

505,926. ARMATURE FOR ELECTRIC MACHINES. Albert Schmid, Pittsburg, Pa.

505,927. ALTERNATING-CURRENT GENERATOR. Albert Schmid, Pittsburg, Pa.

505,928. SYSTEM FOR ELECTRICAL DISTRIBUTION. Charles F. Scott, Pittsburg, Pa.

505,957. ARMATURE. Martin Rahner, Union, N. J.

505,994. ELECTRO-CONDUCTING BEARING FOR TROLLEY OR OTHER WHEELS. Elmer A. Sperry, Chicago, Ill.

506,001. CONTROLLING DEVICE FOR ELECTRIC RAILWAY CARS. William P. Coldren, Lebanon, Pa.

506,002. INSULATING-SUPPORT FOR METALLIC CIRCUITS. Alfred C. Cousens, Boston, Mass.

506,066. MEANS FOR DETERMINING THE PRESENCE AND INTENSITY OF ATMOSPHERIC ELECTRICITY. Jesse Opperman, St. Louis, Mo.

506,092. ELECTRICAL SWITCH. Carl O. C. Billberg, Philadelphia, Pa.

506,124. ELECTRIC-RAILWAY SYSTEM. Harry A. Lewis, Norristown, Pa.

506,132. COIN-CONTROLLED TELEGRAPHIC CALL APPARATUS. Gradydon Poore, Putney, England.

506,149. ELECTRIC TROLLEY WIRE CROSSING. Edgar B. Binford, Cincinnati, O.

506,169. ELECTRIC ELEVATOR. Ernest R. Esmond, New York, N. Y.